STORMWATER POLLUTION PREVENTION PLAN

for

Seven Seas Neighborhood Park

(Recreational Park Development)

RISK LEVEL *1*

Legally Responsible Person [LRP):

City of Sunnyvale
Sunnyvale City Hall
456 West Olive Avenue
Sunnyvale, Ca 94086
Project Manager: Kent Steffens, Director of Public Works
(408) 730-7500

Prepared for:

City of Sunnyvale

Project Address:

1010 – 1024 Morse Avenue
Sunnyvale, California 94089

SWPPP Prepared by:

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Santa Cruz, California 95062
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QSD/QSP: David Ramsey P.E.
Job #11048

SWPPP Preparation Date

March 19, 2013

Estimated Project Dates:

Start of Construction	**June 28th, 2013**	Completion of Construction	**May 7th, 2014**

Table of Contents

Qualified SWPPP Developer

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name:	*Seven Seas Neighborhood Park*
Project Number/ID	*PR11/04-13*

"This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD Signature	*Date*
David Ramsey	*20758*
QSD Name	*QSD Certificate Number*
Project Engineer & QSD/P	*(831) 426-5313*
Title and Affiliation	*Telephone Number*
davidramsey@iflandengineers.com	
Email	

Legally Responsible Person

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: Seven Seas Neighborhood Park

Project Number/ID *PR11/04-13*

"I certify under penalty of law that this document and all Attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

City of Sunnyvale

Legally Responsible Organization

Signature of Authorized Representative of Legally Responsible Organization or Approved Signatory

Date

Kent Steffens

Name of Authorized Representative of Legally Responsible Organization or Approved Signatory

(408) 730-7500

Telephone Number

Amendment Log

Project Name: Seven Seas Neighborhood Park

Project Number/ID *PR11/04-13*

Amendment No.	Date	Brief Description of Amendment, include section and page number	Prepared and Approved By
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#

Section 1 SWPPP Requirements

1.1 INTRODUCTION

Seven Seas Neighborhood Park is located on the east side of Morse Avenue, just north of East Weddell Drive and the Hetch-Hetchy aqueduct. The Site is approximately 5.2 acres in size and is identified by the following Santa Clara County Assessor's Parcel Number: APN 110-14-202. The Site is bordered to the north and east by recently-constructed residential townhome units; to the northeast by Global Crossing, a communication technology company; to the south by the Hetch-Hetchy aqueduct; and to the west by Morse Avenue and multi-family residential across Morse Avenue.

The Site has been owned by the City of Sunnyvale since approximately 1991. The Site was leased until recently to a number of tenants for private industrial and commercial uses. Past uses have included machine shops and metal fabrication. The Site was developed initially in the mid- to late-1970s, and was part of a larger orchard prior to its current development.

The projects location is shown on the Site Map in Appendix B.

This Stormwater Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ (NPDES No. CAS000002) issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the SWPPP Template provided on the California Stormwater Quality Association Stormwater *Best Management Practice Handbook Portal: Construction* (CASQA, 2010). In accordance with the General Permit, Section XIV, this SWPPP is designed to address the following:

- Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard;

Calculations and design details as well as BMP controls for, are complete and correct, see Appendix A.

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Stormwater Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site Map;
4. Annual Fee;
5. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and
6. SWPPP.

Site Maps can be found in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The discharger shall make the SWPPP available at the construction site during working hours (see Section 7.5 of CSMP for working hours) while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. (CGP Section XIV.C)

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP AMENDMENTS

The General Permit requires that SWPPP be amended or revised by a QSD (Section XIV.A) and that the SWPPP include a listing of the date of initial preparation and the date of each amendment. Amendments must be signed by a QSD (Section VII.B.6). In addition, the General Permit specifies that the SWPPP shall be amended under the following circumstances:

- "Within two business days (48 hours) after each qualifying rain event, dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly". (General Permit, Attachment C, D, or E part I.3.G).

- "This General Permit requires dischargers with NAL and NEL exceedances to immediately implement additional BMPs and revise their Stormwater Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-

stormwater discharges from contaminating stormwater, or to substantially reduce the pollutants to levels consistently below the NALs or NELs." (General Permit Section I Part H No. 57 and 59)

- "Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include: ... SWPPP revisions, as appropriate ..." (General Permit Section II Part C)

The SWPPP should be revised when:

- If there is a General Permit violation.
- When there is a reduction or increase in total disturbed acreage (General Permit Section II Part C).
- BMPs do not meet the objectives of reducing or eliminating pollutants in stormwater discharges.

Additionally, the SWPPP shall be amended when:

- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- When there is a change in the project duration that changes the project's risk level; or
- When deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;
- The original BMP proposed, if any; and
- The new BMP proposed.

Amendment shall be logged at the front of the SWPPP and certification kept in Appendix D. The SWPPP text shall be revised replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Table 1.1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP[1]	Check changes that can be field located or field determined by QSP
Increase quantity of an Erosion or Sediment Control Measure	*X*
Relocate/Add stockpiles or stored materials	
Relocate or add toilets	*X*
Relocate vehicle storage and/or fueling locations	
Relocate areas for waste storage	*X*
Relocate water storage and/or water transfer location	
Changes to access points (entrance/exits)	
Change type of Erosion or Sediment Control Measure	
Changes to location of erosion or sediment control	*X*
Minor changes to schedule or phases	*X*
Changes in construction materials	
(1) Any field changes not identified for field location or field determination by QSP must be approved by QSD	

1.5 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP shall be retained for a minimum of three years from the date generated or date submitted, whichever is later, for the following items:

- SWPPP Amendments
- PRD's
- Field Reports / logs
- Inspection reports

These records shall be available at the Site until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board, State Water Board or U.S. Environmental Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years shall be adhered to.

1.6 REQUIRED NON-COMPLIANCE REPORTING

If a discharge violation occurs the QSP shall immediately notify the LRP and the LRP shall file a violation report electronically to the Regional Water Board within 30 days of identification of non-compliance using SMARTS. Corrective measures will be implemented immediately following the discharge or written notice of non-compliance from the Regional Water Board.

The report to the LRP and to the Regional Water Board will contain the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.

The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

1.7 ANNUAL REPORT

The General Permit requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1st of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed in SMARTS and in accordance with information required by the on-line forms.

1.8 CHANGES TO PERMIT COVERAGE

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, shall be logged at the front of the SWPPP and cetrification of SWPPP amendments are to be kept in Appendix D. Updated PRDs submitted electronically via SMARTS can be found in Appendix E.

1.9 NOTICE OF TERMINATION

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. The NOT shall be submitted within 90 days of completion of construction. The Regional Water Board will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

Section 2 Project Information

2.1 PROJECT AND SITE DESCRIPTION

2.1.1 Site Description

Seven Seas Neighborhood Park is located on the east side of Morse Avenue, just north of East Weddell Drive
and the Hetch-Hetchy aqueduct (600 ft north of Highway 101, and 2,350 ft south of Highway 237). The Site is approximately 5.2 acres in size and is identified by the following Santa Clara County Assessor's Parcel Number: APN 110-14-202 (Address 1010-1024 Morse Avenue, Sunnyvale, Ca).

The Site is bordered to the north and east by recently-constructed residential townhome units; to the northeast by Global Crossing, a communication technology company; to the south by the Hetch-Hetchy aqueduct; and to the west by Morse Avenue and multi-family residential across Morse Avenue.

The project site is located approximately 10 miles east of Stevens Creek, 5 miles west of Saratoga Creek and approximately 4.5 miles southeast of the southern portion of the San Francisco Bay. The project is located at 37.3982° Latitude and -122.0162° Longitude and is identified on the Site Map in Appendix B.

2.1.2 Existing Conditions

As of the initial date of this SWPPP, the project site is vacant with bare soils. The Site was leased until recently to a number of tenants for private industrial and commercial uses. Past uses have included machine shops and metal fabrication. The Site was developed initially in the mid- to late-1970s, and was part of a larger orchard prior to its current development.

Previous environmental investigations have found that the chemical of concern ("COC") in soil at the Site is arsenic. The maximum arsenic concentration detected in soil is 53.1 milligrams per kilogram ("mg/kg"). Lead has also been detected up to a concentration of 190 mg/kg, but was not retained as a COC.

2.1.3 Existing Drainage

The project site is relatively level, with a general slope to the north. The elevation of the project site ranges from 21 feet to 18.5 feet above mean sea level (msl). Surface drainage at the site currently flows to valley gutters, curb gutters, and several storm water drop inlets currently present at the Site. There is a curb gutter along the eastern property boundary (which has been damaged in some areas by the trees' roots), one north of building 1014 along the northern property boundary, another one along the southern property boundary, and one between buildings 1016 and 1020/1024. There is a valley gutter that runs parallel to buildings 1012 and 1014 and another one between buildings 1010 and 1016. The Site drains to the valley gutters, next to the on-Site storm drain system, and then to the main storm drain located in Morse Avenue.

Stormwater discharges, from the site, are not considered direct discharges, as defined by the State Water Board into the San Francisco Bay. Existing site topography, drainage patterns, and stormwater conveyance systems are shown on the Existing Conditions & Demolition Plan, Sheet C1, by Ifland Engineers, Inc.

2.1.4 Geology and Groundwater

Refer to the Geotechnical Investigation "Seven Seas Neighborhood Park" by Treadwell & Rollo, A Langan Company, dated, August 26, 2012, Project # 770602501. Refer to Appendix N for report.

2.1.5 Project Description

Project grading will occur on approximately 100% of the project area. The limits of grading are shown on the Grading & Drainage Plans, Sheets C4.1 & C4.2, by Ifland Engineers, Inc., see site maps in Appendix B. Grading will include mainly fill activities, with the total graded material estimated to be 18,010 cubic yards. Approximately 17,810 cubic yards of fill material will be imported during grading activities. Soil will be stockpiled at the contractor's discretion based on construction activities and scheduling. Construction activities will not be phased.

2.1.6 Developed Condition

Post construction surface drainage will be directed to the northwest corner of the site. There are several different permanent BMP measures proposed throughout the site prior to runoff leaving the property. The impervious surfaces are directed to Bio-treatment raingardens, vegetated swales, and other BMP features. There is also an underground pipe system which connects area drains and subdrains throughout the parcel and ultimately discharges runoff to the main system within Morse Avenue.

Post construction drainage patterns and conveyance systems are presented on the Grading & Drainage Plans, Sheets C4.1 & C4.2, by Ifland Engineers, Inc., see site maps in Appendix B.

Table 2.1 Construction Site Estimates

Construction site area	5.33	acres
Percent impervious before construction	95	%
Runoff coefficient before construction	0.87	
Percent impervious after construction	38	%
Runoff coefficient after construction	0.53	

2.2 PERMITS AND GOVERNING DOCUMENTS

No other permits are required at this time for this project.

2.3 STORMWATER RUN-ON FROM OFFSITE AREAS

Run-on to the site is generated by minimal impervious surface runoff from the adjacent parcel south of the subject parcel.

The stormwater runoff drainage area contributing to offsite run-on is estimated to be approximately 4,000 square feet. The anticipated runoff coefficient is 0.9. The anticipated off-site run-on to the project site is estimated to be 0.15 cfs, calculations are included in Appendix A.

The General Permit requires that temporary BMPs be implemented to direct offsite run-on away from disturbed areas through the use of runoff controls. The offsite run-on will be directed to raingardens along the southern property line, utilizing the existing drain inlets to convey overflow runoff to the underground pipe system. The off-site drainage areas and associated stormwater conveyance facilities or BMPs are shown on Grading & Drainage Plans, Sheets C4.1 & C4.2, by Ifland Engineers, Inc., in Appendix B.

2.4 FINDINGS OF THE CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 1.

The risk level was determined though the use of the Environmental Protection Agency's website and figures. Refer to Table 2.2 for more detailed findings and figures. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix C.

Table 2.2 and Table 2.3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors.

Table 2.2 Summary of Sediment Risk

RUSLE Factor	Value	Method for establishing value
R	34.83	EPA's Construction Rainfall Erosivity Waiver Fact Sheet (http://cfpub.epa.gov/npdes/stormwater/lew/lewcalculator.cfm)
K	0.32	GIS Map provided by the U.S. Department of Agriculture and State Water Resources Control Board (ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cqp/)
LS	0.36	GIS Map (Google Earth Overlay) Provided the U.S. Department of Agriculture and State Water Resources Control Board
Total Predicted Sediment Loss (tons/acre)		
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre		☒ **Low** ☐ **Medium** ☐ **High**

Runoff from the project site discharges into the city's municipal system with Morse Avenue. The system does not directly nor indirectly connect to an impaired water body. Therefore, the receiving water risk is Low. The closest water body to the system is the San Francisco Bay as described in Section 2.

Table 2.3 Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant[1]	TMDL for Sediment Related Pollutant[1]	Beneficial Uses of COLD, SPAWN, and MIGRATORY[1]
None (see above)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Overall Receiving Water Risk			☒ **Low** ☐ **High**

Table 2.3 Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant[1]	TMDL for Sediment Related Pollutant[1]	Beneficial Uses of COLD, SPAWN, and MIGRATORY[1]
(1) If yes is selected for any option the Receiving Water Risk is High			

Sediment Risk Factor Worksheet	Entry
A) R Factor	
Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.	
http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm	
R Factor Value	34.8
B) K Factor (weighted average, by area, for all site soils)	
The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.	
Site-specific K factor guidance	
K Factor Value	0.32
C) LS Factor (weighted average, by area, for all slopes)	
The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.	
LS Table	
LS Factor Value	0.36

Watershed Erosion Estimate (=RxKxLS) in tons/acre	4.00896
Site Sediment Risk Factor Low Sediment Risk: < 15 tons/acre Medium Sediment Risk: >=15 and <75 tons/acre High Sediment Risk: >= 75 tons/acre	**Low**

Receiving Water (RW) Risk Factor Worksheet	**Entry**	**Score**
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml **OR**	**No**	**Low**
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml		

Combined Risk Level Matrix

Receiving Water Risk \ Sediment Risk	Low	Medium	High
Low	Level 1	Level 2	
High	Level 2		Level 3

Project Sediment Risk: Low

Project RW Risk: Low

Project Combined Risk: Level 1

Risk Level 1

Risk Level 1 sites are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater through the use of controls, structures, and best management practices. This SWPPP has been prepared to address Risk Level 1 requirements (General Permit Attachment C).

2.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on construction taking place between June 28, 2013 and May 7, 2014. Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during construction to address potential impact to the SWPPP. The estimated schedule for planned work can be found in Appendix F.

A more detailed construction schedule will be provided and upload to the SMARTS program once a contractor has been selected.

2.6 POTENTIAL CONSTRUCTION ACTIVITY AND POLLUTANT SOURCES

Appendix G includes a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to stormwater runoff. For a summary of potential pollutants refer to table 2.4

The anticipated activities and associated pollutants were used in Section 3 to select the Best Management Practices for the project. Location of anticipated pollutants and associated BMPs are show on the Site Map in Appendix B.

For sampling requirements for non-visible pollutants associated with construction activity please refer to Section 7.7.1. For a full and complete list of onsite pollutants, refer to the Material Safety Data Sheets (MSDS), which are retained onsite at the construction trailer.

Table 2.4 Summary of Potential Pollutants

Construction Activities	Pollutant Source	Potential Stormwater Pollutants
Soil Excavation	Soil from excavation activities carried to streets or off-Site by runoff and wind.	Sediment, dust, metals, and organochlorine pesticides.
Stockpiling of Soil	Wind erosion, dust, and runoff from stockpile.	Sediment, dust, metals, and organochlorine pesticides.
Off-Haul of Soil	Tracking of dirt from Site to streets. Runoff from transportation route (e.g. roads) to storm drains or streams.	Sediment, dust, metals, and organochlorine pesticides.
General Grading	Water from runoff. Wind erosion from Site.	Sediment, dust.
Construction Equipment Fueling and Maintenance	Spills from fueling and maintenance operations.	Diesel fuel, motor oil, hydraulic oil, antifreeze/coolant.

Construction Equipment Leaks	Leaking construction equipment.	Diesel fuel, motor oil, hydraulic oil, antifreeze/coolant.
Construction Equipment Cleaning	Cleaning of trucks in equipment Decontamination area.	Sediment, metals, organochlorine pesticides, diesel fuel, motor oil, hydraulic oil, antifreeze/coolant.

2.7 IDENTIFICATION OF NON-STORMWATER DISCHARGES

Non-stormwater discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-stormwater discharges that do not cause erosion or carry other pollutants.

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP, or authorized under a separate NPDES permit, are prohibited.

Non-stormwater discharges that are authorized from this project site include the following:

- Watering for Wind Erosion & Dust Control
- Dewatering of groundwater
- Fire Hydrant and/or pipe flushing and testing
- Irrigation/watering for vegetative erosion control measures

These authorized non-stormwater discharges will be managed with the stormwater and non-stormwater BMPs described in Section 3 of this SWPPP and will be minimized by the QSP.

Activities at this site that may result in unauthorized non-stormwater discharges include:

- Concrete Washout
- Wash water from cleaning painting equipment
- Sanitary Waste
- Chemical leaks and/or spills of any kind including but not limited to petroleum, paints, cure compounds, etc.

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated on-site.

Discharges of construction materials and wastes, such as fuel or paint, resulting from dumping, spills, or direct contact with rainwater or stormwater runoff, are also prohibited.

2.8 REQUIRED SITE MAP INFORMATION

The construction project's Site Map(s) showing the project location, surface water boundaries, geographic features, construction site perimeter and general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B. Table 2.5 identifies Map or Sheet Nos. where required elements are illustrated.

Table 2.5 Required Map Information

Included on Map/Plan Sheet No. [1]	Required Element	
Cover	The project's surrounding area (vicinity)	*LIST OF SHEETS* C1 – Existing Conditions & Demolition Plan C2 – Site Plan C3 –Site Utility Plan C4.1– Site Grading & Drainage Plan (South) C4.2– Site Grading & Drainage Plan (North) C4.3– Details C5 –Grading Cross-Sections C6 – S EC1 – Erosion Control Plan EC2– Erosion Control Details Post- Development Drainage Exhibit (Drainage Study Only)
C2	Site layout	
C2	Construction site boundaries	
Drainage Exhibit	Drainage areas	
C4.1 & C4.2	Discharge locations	
EC1	Sampling locations	
C4.1-C4.3	Areas of soil disturbance (temporary or permanent)	
C4.1-C4.3	Active areas of soil disturbance (cut or fill)	
C4.1-C4.3, EC1	Locations of runoff BMPs	
EC1	Locations of erosion control BMPs	
EC1	Locations of sediment control BMPs	
N/A	Locations of sensitive habitats, watercourses, or other features which are not to be disturbed	
C4.1-C4.3	Locations of all post construction BMPs	
EC1	Waste storage areas	
EC1	Vehicle storage areas	
EC1	Material storage areas	
EC1	Entrance and Exits	
N/A Offsite	Fueling Locations	

Notes: (1) Indicate maps or drawings that information is included on (e.g., Vicinity Map, Site Map, Drainage Plans, Grading Plans, Progress Maps, etc.)

Section 3 Best Management Practices

3.1 SCHEDULE FOR BMP IMPLEMENTATION

Table 3.1 **BMP Implementation Schedule**

	BMP	Phase of Development	Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to	Prior to Construction	Entirety of Project
	EC-2, Preservation of Existing Vegetation	Grading & Land Development	Start of Construction	Entirety of Project
	EC-4, Hydroseeding	Final Landscape & Site Stabilization	End of Construction / inactive areas	As necessary for stabilization
	EC-6, Straw Mulch	Final Landscape & Site Stabilization	Immediately after applying EC-4	As necessary for stabilization
Sediment Control	SE-3, Sediment Trap	Grading & Land Development	At commencement of grading	Throughout rough grading phase
	SE-5, Fiber Rolls	Grading & Land Development	Start of Construction	Entirety of Project
	SE-7, Street Sweeping	Grading & Land Development	Start of Construction	Entirety of Project min. once daily
	SE-10, Storm Drain Inlet Protection	Grading & Land Development	Start of Construction	Entirety of Project
	WM-1, Stockpile Management	Grading & Land Development	Start of Construction	End of Streets and Utility Phase
Tracking Control	TC-1, Stabilized Construction Entrance/Exit	Grading & Land Development	Start of Construction	End of Streets and Utility Phase
	TC-3, Entrance/Outlet Tire Wash	Grading & Land Development	Start of Construction	End of Streets and Utility Phase
Wind Erosion	WE-1, Wind Erosion Control	Grading & Land Development	Start of Construction	End of Streets and Utility Phase

3.2 EROSION AND SEDIMENT CONTROL

Sufficient quantities of temporary sediment control materials shall be maintained on-site throughout the duration of the project. Allowing for implementation of temporary sediment controls in the event of predicted rain and for rapid response do to failures or emergencies, in conformance with other General Permit requirements and as described in this SWPPP.

Table 3.2 **Erosion and Sediment Control**

General Permit BMP Requirements	Applicable to Project?	CGP Pg #	Associated CASQA BMPs	Selected BMPs
BMP Requirements for Erosion and Sediment Control (Attachment C, D, & E parts D and E)				
Implement effective wind erosion control.	Yes	Pg 5 of Att. C, D & E	WE-1	WE-1
Provide effective soil cover for inactive areas and finished slopes, open space, utility backfill, and completed lots.	Yes	Pg 5 of Att. C, D & E	EC-5 EC-16	EC-4 EC-6
Limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the QSD shall consider the use of plastic materials resistant to solar degradation.	Yes	Pg 5 of Att. C, D & E	WM-3	WM-3
Establish and maintain effective perimeter controls and stabilize construction entrances and exits to sufficiently control erosion and sediment discharges from the site.	Yes	Pg 5 of Att. C, D & E	SE-1 ,SE-5 SE-7, TC-1 TC-2, TC-3 WM-3	SE-5, SE-7, TC-1, TC-3, WM-3
On sites where sediment basins are to be used, at a minimum, design sediment basins according to the method provided in *Stormwater BMP Handbook Portal: Construction*.	Yes	Pg 5 of Att. C, D & E	SE-02	SE-3
Implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[4] construction.	Yes	Pg 5 of Att. C, D & E	EC-1, EC-2 EC-5, EC-9 EC-10, EC-16 SE-1, SE-4 SE-5,	EC-1, EC-2, EC-6, SE-5
Apply linear sediment controls along the toe of the slope; face of the slope; and at the grade breaks of exposed slopes to comply with sheet flow lengths in accordance with General Permit.	Yes	Pg 5 of Att. D & E	SE-1 ,SE-5 SE-7	SE-5, SE-7
Ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.	Yes	Pg 6 of Att. D & E	TC-1 TC-2 TC-3 SE-7	TC-1, TC-3, SE-7

Table 3.2 **Erosion and Sediment Control**

General Permit BMP Requirements	Applicable to Project?	CGP Pg #	Associated CASQA BMPs	Selected BMPs
Ensure that storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire wash-off locations) are maintained and protected from activities that reduce their effectiveness.	Yes	Pg 6 of Att. D & E	All BMPs	See above
Inspect on a daily basis immediate access roads. At a minimum daily (when necessary) and prior to a rain event. The LRP shall remove sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).	Yes	Pg 6 of Att. D & E	TC-1 TC-2 TC-3 SE-7	TC-1, TC-3, SE-7,
The Regional Water Board may require implementation of additional site-specific sediment control requirements if the implementation of the other requirements in this section is not adequately protecting the receiving waters.		Pg 5 Att. C Pg 6 Att. D & E	N/A	
BMP Requirements for Air Deposition (Attachment C, D, & E parts B.6)				
Control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.	Yes	Pg 4 of Att. C, D & E	WE-1	WE-1

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

3.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in stormwater runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

1. Preserve existing vegetation where required and when feasible.
2. The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
3. Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
4. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.

5. Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

The following temporary erosion control BMP selection table indicates the BMPs that shall be implemented to control erosion on the construction site. Fact Sheets for temporary erosion control BMPs are provided in Appendix H.

Table 3.3 Temporary Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	X		
EC-2	Preservation of Existing Vegetation	✓	X		
EC-3	Hydraulic Mulch	✓[2]		X	EC-4 to be used
EC-4	Hydroseed	✓[2]	X		
EC-5	Soil Binders	✓[2]		X	EC-4 will be used in combination with EC-6, Therefore, N/A
EC-6	Straw Mulch	✓[2]	X		
EC-7	Geotextiles and Mats	✓[2]		X	N/A
EC-8	Wood Mulching	✓[2]		X	N/A
EC-9	Earth Dike and Drainage Swales	✓[3]	X		
EC-10	Velocity Dissipation Devices			X	N/A
EC-11	Slope Drains			X	N/A
EC-12	Stream Bank Stabilization			X	N/A
EC-14	Compost Blankets	✓[2]		X	N/A
EC-15	Soil Preparation-Roughening		X		
EC-16	Non-Vegetated Stabilization	✓[2]		X	N/A
WE-1	Wind Erosion Control	✓	X		
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD.
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
[3] Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Scheduling

Construction and BMP implementation schedule will be provided, prior to construction, to create and efficient job site. This will reduce the duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking

Preservation of Existing Vegetation

Will help minimize the potential of removing or injuring native plants adjacent to the project site along Soquel Avenue and Capitola Road Extension.

Hydroseed

Should be used in all in-active areas (no work being performed for 14 days or more) to protect soils from erosion. Hydroseeding should also be used at the end of construction to temporarily protect ground until permanent stabilization is established.

Straw Mulch

Should be used wherever and whenever hydroseeding is performed. The straw mulch gives added protection to the hydroseeding process.

Earth Dike & Drainage Swales

Should be used to divert runoff or channel water to a desired location.

Wind Erosion Control

Will help control dust from construction activities. Water should be applied at a minimum once daily and as necessary to alleviate dust nuisance from construction.

3.2.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

The following sediment control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H.

Table 3.4 Temporary Sediment Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓[2] [3]		X	**Fiber rolls used in lieu of**
SE-2	Sediment Basin			X	N/A
SE-3	Sediment Trap		X		
SE-4	Check Dams			X	N/A
SE-5	Fiber Rolls	✓[2][3]	X		
SE-6	Gravel Bag Berm	✓[3]		X	N/A
SE-7	Street Sweeping	✓	X		
SE-8	Sandbag Barrier			X	N/A
SE-9	Straw Bale Barrier			X	N/A
SE-10	Storm Drain Inlet Protection	✓ RL2&3	X		
SE-11	ATS			X	N/A
SE-12	Temporary Silt Dike			X	N/A
SE-13	Compost Sock and Berm	✓[3]		X	N/A
SE-14	Biofilter Bags	✓[3]		X	N/A
TC-1	Stabilized Construction Entrance and Exit	✓	X		
TC-2	Stabilized Construction Roadway			X	N/A
TC-3	Entrance Outlet Tire Wash		X		
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements
[3]Risk Level 2 &3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope

These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Sediment Trap

Should be placed at the low points of the site to control and capture sediment prior to running off site. Sediment Traps can be removed after rough grading phase.

Fiber Rolls

Shall remain in place throughout construction and will be placed along the slope at all low points and potential areas of runoff off site. Fiber Rolls should be relocated as necessary throughout construction to eliminate potential pollutants from leaving the site.

Street Sweeping

Shall be performed twice daily or as necessary to prevent sediment from tracking onto public roads.

Storm Drain Inlet Protection

Shall be placed at all existing drain inlets adjacent to and immediately downstream of the project site. Inlet Protections shall be placed at all new drain inlets as they are installed until site is stabilized and complete.

Stabilized Construction Entrance and Exit

There shall be one construction entrance where all construction vehicles and deliveries will access and exit the site. The entrance shall be located off of Soquel Avenue at the existing driveway apron.

Entrance Outlet Tire Wash

Above referenced construction entrance shall be equipped with an outlet tire wash for added protection to the adjacent road and nearby creek.

3.3 NON-STORMWATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT

Table 3.5 Non-Stormwater, Construction Materials & Waste Management

BMP Requirements	Applicable to Project?	CGP Pg#	Associated CASQA BMPs	BMP selected for SWPPP
BMP Requirements for Waste Management (Attachment C, D and E part B.2)				
Prevent disposal of rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.		Pg 2, Att. C, D & E	NS-1, NS-3 NS-8, NS-12 NS-13	NS-3
Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the stormwater drainage system or receiving water.		Pg 2, Att. C, D & E	WM-9	WM-9
Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.		Pg 2, Att. C, D & E	WM-9	WM-9
Cover waste disposal containers at the end of every business day and during a rain event. Prevent discharges from waste disposal containers to the stormwater drainage system or receiving water. Minimize exposure of construction materials to precipitation.		Pg 2, Att. C, D & E	WM-1 , M-2 WM-4 , M-5 WM-6, WM-7 WM-10	WM-1, WM-2, WM-4, WM-5, WM-6, WM-7, WM-10
Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).		Pg 2, Att. C, D & E	WM-3	WM-3
Implement procedures that effectively address hazardous and non-hazardous spills. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that: Equipment and materials for cleanup of spills shall be available onsite and that spills and leaks shall be cleaned up immediately and disposed of properly; and appropriate spill response personnel are assigned and trained.		Pg 2, Att. C, D & E	WM-4	WM-4
Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.		Pg 3, Att. C, D & E	WM-8	WM-8
BMP Requirements for Construction Material (Attachment C, D, and E part B.1)				
Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced.		Pg 1, Att. C, D & E		

Table 3.5 **Non-Stormwater, Construction Materials & Waste Management**

BMP Requirements	Applicable to Project?	CGP Pg#	Associated CASQA BMPs	BMP selected for SWPPP
Store chemicals in watertight containers (with appropriate secondary containment to prevent spillage or leakage) or in a storage shed (completely enclosed).		Pg 2, Att. C, D & E	WM-1, WM-2 WM-4, WM-6	WM-1, WM-2 WM-4, WM-6
Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.		Pg 2, Att. C, D & E	TC-1 TC-2 TC-3	TC-1, TC-2
BMP Requirements for Vehicle Storage and Maintenance (Attachment C, D and E, part B.3)				
Prevent oil, grease, or fuel from leaking into the ground, storm drains or surface waters.		Pg 3, Att. C, D & E	NS-9 NS-10	NS-9, NS-10
Place equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.		Pg 2, Att. C, D & E	WM-2, WM-4 NS-9, NS-10	WM-2, WM-4 NS-9, NS-10
Clean leaks immediately and disposing of leaked materials properly.		Pg 2, Att. C, D & E	WM-4	WM-4
BMP Requirements to Control Non-Stormwater Discharges (Attachment C, D and E part C)				
Implement measures to control non-stormwater discharges during construction.		Pg 4, Att. C, D & E	NS-3, NS-8 NS-9, NS-10 NS-12, NS-13 TC-1, TC-2 TC-3	NS-3, NS-8 NS-9, NS-10 NS-12, NS-13 TC-1, TC-2 TC-3
Clean streets in such a manner as to prevent non-stormwater discharges from reaching surface water or MS4 drainage systems.		Pg 4, Att. C, D & E	TC-1, TC-2 TC-3, SE-7	TC-1, TC-2 TC-3, SE-7

3.3.1 Non-Stormwater Controls

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-stormwater discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Section 2.7 of this SWPPP.

The following non-stormwater control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary non-stormwater control BMPs are provided in Appendix H.

Table 3.6 Temporary Non-Stormwater BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	X		
NS-2	Dewatering Operation			X	No groundwater encountered
NS-3	Paving and Grinding Operation		X		
NS-4	Temporary Stream Crossing			X	No Stream Crossings
NS-5	Clear Water Diversion			X	N/A
NS-6	Illicit Connection- Illegal Discharge Connection	✓	X		
NS-7	Potable Water Irrigation Discharge Detection			X	N/A
NS-8	Vehicle and Equipment Cleaning	✓		X	Not permitted at construction site
NS-9	Vehicle and Equipment Fueling	✓	X		Should be used only if necessary
NS-10	Vehicle and Equipment Maintenance	✓	X		Should be used only if necessary
NS-11	Pile Driving Operation			X	N/A
NS-12	Concrete Curing		X		
NS-13	Concrete Finishing		X		
NS-14	Material and Equipment Use Over Water			X	N/A
NS-15	Demolition Removal Adjacent to Water			X	N/A
NS-16	Temporary Batch Plants			X	N/A
Alternate BMPs Used:			**If used, state reason:**		

[1] Applicability to a specific project shall be determined by the QSD

Non-stormwater BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Water Conservation Practices

Water for dust control, washing, and other activities, should be used in a manner that avoids causing erosion and/or the transport of pollutants off site.

Paving and Grinding Operation

Grinding and pavement removal will take place during the demolition phase of the project. New paving will begin shortly after the rough grading phase.

Illicit Connection- Illegal Discharge Connection

There shall be no illegal discharge or dumping from the construction site.

Vehicle and Equipment Cleaning

Should not be performed on site

Vehicle and Equipment Fueling

Shall only be done if necessary, otherwise all equipment fueling shall be done off-site prior to work.

Vehicle and Equipment Maintenance

Shall only be performed onsite if necessary, otherwise general maintenance and vehicle service shall be done off-site at contractors yard or maintenance shop.

Concrete Curing

Concrete Curing should only be performed if necessary during the final stages of construction to provide designed finishings on concrete surfaces, i.e. sidewalks & driveways.

Concrete Finishings

Concrete Finishings should only be performed if necessary during the final stages of construction to provide designed finishings on concrete surfaces, i.e. sidewalks & driveways.

3.3.2 Materials Management and Waste Management

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into stormwater discharges. The amount and type of construction materials to be utilized at the Site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into stormwater discharges.

Materials and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction materials, wastes and service areas; and to prevent materials and wastes from being discharged off-site. The primary mechanisms for stormwater contact that shall be addressed include:

- Direct contact with precipitation
- Contact with stormwater run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with some materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into stormwater.

A list of construction activities is provided in Section 2.6. The following Materials and Waste Management BMP selection table indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H.

Table 3.7 Temporary Materials Management BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	X		
WM-02	Material Use	✓	X		
WM-03	Stockpile Management	✓	X		
WM-04	Spill Prevention and Control	✓	X		
WM-05	Solid Waste Management	✓	X		
WM-06	Hazardous Waste Management	✓	X		
WM-07	Contaminated Soil Management			X	QSP Shall modify if encountered during construction
WM-08	Concrete Waste Management	✓	X		
WM-09	Sanitary-Septic Waste Management	✓	X		
WM-10	Liquid Waste Management			X	QSP Shall modify if encountered during construction
Alternate BMPs Used:				**If used, state reason:**	

[1] Applicability to a specific project shall be determined by the QSD.

Material management BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Material Delivery and Storage

All material shall be stored in an enclosed area, or offsite until day of use.

Material Use

All materials shall be used to reduce and/or eliminate the possibility of pollutants offsite

Stockpile Management

All stockpile areas, shall be covered and surrounded by fiber rolls, to contain all soil, debris and other materials from leaving the site.

Spill Prevention and Control

A spill prevention and control plan shall be developed and maintained onsite at all times

Solid Waste Management

All construction waste shall be collected in a solid container and removed offsite once container is full. Said container shall be covered at the end of every working day

Hazardous Waste Management

All hazardous waste material shall be removed off-site r kept in a secured enclosed area.

Contaminated Soil Management

If contaminated soils are encountered during construction, said soils shall be removed and disposed of according to environmental standards.

Concrete Waste Management

Dispose of all concrete waste according to this BMP

Sanitary-Septic Waste Management

Dispose of sanitary waste as necessary and in accordance with the supplier's recommendations.

3.4 POST CONSTRUCTION STORMWATER MANAGEMENT MEASURES

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

This site is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Stormwater Management Plan. ☒ Yes ☐ No

Post construction runoff reduction requirements have been satisfied through the MS4 program, this project is exempt from provision XIII A of the General Permit.]

A plan for the post construction funding and maintenance of these BMPs has been developed to address at minimum five years following construction. The post construction BMPs that are described above shall be funded and maintained by the LRP. If required, post construction funding and maintenance will be submitted with the NOT.

Section 4 BMP Inspection and Maintenance

4.1 BMP INSPECTION AND MAINTENANCE

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 7.6. A blank inspection checklist can be found in Appendix I. Completed checklists shall be kept in CSMP Attachment 2 "Monitoring Records.

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix H.

4.2 RAIN EVENT ACTION PLANS

Rain Event Action Plans (REAPs) are not required for Risk Level 1 projects.

Section 5 Training

The following text should be modified accordingly

Appendix L identifies the QSPs for the project. To promote stormwater management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix K, which identifies the site-specific stormwater topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation; BMP inspection and maintenance; and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix K.

Section 6 Responsible Parties and Operators

6.1 RESPONSIBLE PARTIES

Approved Signatories who are responsible for SWPPP implementation and have authority to sign permit-related documents are listed below. Written authorizations from the LRP for these individuals are provided in Appendix L. The Approved Signatories assigned to this project are:

Section to be filled out by the LRP if Approved Signatories are preferred

Name	Title	Phone Number

QSPs identified for the project are identified in Appendix L. The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the General Permit and SWPPP, including but not limited to:
  - Ensuring all BMPs are implemented, inspected, and properly maintained;
  - Performing non-stormwater and stormwater visual observations and inspections;
  - Performing non-stormwater and storm sampling and analysis, as required;
  - Performing routine inspections and observations;
  - Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the General Permit and approved plans at all times.

- Notifying the LRP or Authorized Signatory immediately of off-site discharges or other non-compliance events.

6.2 CONTRACTOR LIST

Section to be filled out once a contractor is selected for the project

Contractor

Name:

Title:

Company:

Address:

Phone Number:

Number (24/7):

Section 7 Construction Site Monitoring Program

7.1 Purpose

This Construction Site Monitoring Program was developed to address the following objectives:

1. To demonstrate that the site is in compliance with the Discharge Prohibitions of the Construction General Permit;
2. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
3. To determine whether immediate corrective actions, additional Best Management Practices (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges;
4. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

7.2 Applicability of Permit Requirements

This project has been determined to be a Risk Level 1 project. The General Permit identifies the following types of monitoring as being applicable for a Risk Level 1 project.

Risk Level 1

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-stormwater discharges;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of construction site runoff as required by the Regional Water Board when applicable.

7.3. Weather and Rain Event Tracking

Visual monitoring and inspections requirements of the General Permit are triggered by a qualifying rain event. The General Permit defines a qualifying rain event as any event that produces ½ inch of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

7.3.1 Weather Tracking

The QSP should daily consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at http://www.srh.noaa.gov/. Weather reports should be printed and maintained with the SWPPP in CSMP Attachment 1 "Weather Reports".

7.3.2 *Rain Gauges*

The contractor shall install 1 rain gauge on the project site. Locate the gauge in an open area away from obstructions such as trees or overhangs. Mount the gauge on a post at a height of 3 to 5 feet with the gauge extending several inches beyond the post. Make sure that the top of the gauge is level. Make sure the post is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, etc.

The rain gauge(s) shall be read daily during normal site scheduled hours. The rain gauge should be read at approximately the same time every day and the date and time of each reading recorded. Log rain gauge readings in CSMP Attachment 1 "Weather Records". Follow the rain gauge instructions to obtain accurate measurements.

Once the rain gauge reading has been recorded, accumulated rain shall be emptied and the gauge reset.

For comparison with the site rain gauge, the nearest appropriate governmental rain gauge(s) is located at the City of Sunnyvale Water Pollution Control Plant, on Bernardo Avenue. Latitude 37°27'19"N, Longitude122°03'30"W.

7.4 Monitoring Locations

Monitoring locations are shown on the Site Maps in Appendix B. Monitoring locations are described in the Sections 7.6 and 7.7.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

7.5 Safety and Monitoring Exemptions

Safety practices for sample collection will be in accordance with the Contractors Health and Safety Plan. (TO BE PROVIDED BY THE CONTRATOR, SHALL INCLUDE PLAN TITLE AND PUNLICATION DATE)

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours are:

To be determined by the City and/or the selected contractor

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in CSMP Attachment 2 "Monitoring Records".

7.6 Visual Monitoring

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

Table 7.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

Table 7.1 Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency
Routine Inspections	
BMP Inspections	Weekly[1]
BMP Inspections – Tracking Control	Daily
Non-Stormwater Discharge Observations	Quarterly during daylight hours
Rain Event Triggered Inspections	
Site Inspections Prior to a Qualifying Event	Within 48 hours of a qualifying event [2]
BMP Inspections During an Extended Storm Event	Every 24-hour period of a rainevent[2]
Site Inspections Following a Qualifying Event	Within 48 hours of a qualifying event[2]

[1] Most BMPs must be inspected weekly; those identified below must be inspected more frequently.

[2] Inspections are only required during scheduled site operating hours. Note however, these inspections are required daily regardless of the amount of precipitation.

7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit.

7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

7.6.1.2 Non-Stormwater Discharge Observations

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-stormwater discharges. Inspections will record:

- Presence or evidence of any non-stormwater discharge (authorized or unauthorized);

- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

7.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event; following a qualifying rain event, and every 24-hour period during a qualifying rain event. Pre-rain inspections will be conducted after consulting NOAA and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

7.6.2.1 Visual Observations Prior to a Forecasted Qualifying Rain Event

Within 48-hours prior to a qualifying event a stormwater visual monitoring site inspection will include observations of the following locations:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly implemented;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

Consistent with guidance from the State Water Resources Control Board, pre-rain BMP inspections and visual monitoring will be triggered by a NOAA forecast that indicates a probability of precipitation of 50% or more in the project area.

7.6.2.2 BMP Inspections During an Extended Storm Event

During an extended rain event BMP inspections will be conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the rain event, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities.

7.6.2.2 Visual Observations Following a Qualifying Rain Event

Within 48 hours following a qualifying rain event (0.5 inches of rain) a stormwater visual monitoring site inspection is required to observe:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- Need for additional BMPs;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rain water.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel are listed below and their training qualifications are provided in Appendix K.

Assigned inspector: Contact phone:

Alternate inspector: Contact phone:

Stormwater observations shall be documented on the *Visual Inspection Field Log Sheet* (see CSMP Attachment 3 "Example Forms"). BMP inspections shall be documented on the site specific BMP inspection checklist. Any photographs used to document observations will be referenced on stormwater site inspection report and maintained with the Monitoring Records in Attachment 2.

The QSP shall within 14 days of the inspection submit copies of the completed inspection report to the job site and LRP.

The completed reports will be kept in CSMP Attachment 2 "Monitoring Records".

7.6.4 Visual Monitoring Follow-Up and Reporting

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72 hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in CSMP Attachment 2 "Monitoring Records".

The QSP shall within 14 days of the inspection submit copies of the completed *Inspection Field Log Sheet* or *BMP Inspection Report* with the corrective actions to Job Site and LRP.

Results of visual monitoring must be summarized and reported in the Annual Report.

7.6.5 Visual Monitoring Locations

The inspections and observations identified in Sections 7.6.1 and 7.6.2 will be conducted at the locations identified in this section.

BMP locations are shown on the Site Maps in SWPPP Appendix A.

There is 1 major drainage area on the project site which will include the staging areas, and storage areas. Minor drainage areas are shown on the Site Maps in Appendix B. Table 7.2 identifies the major drainage area by location.

Table 7.2 Site Drainage Areas

Location No.	Location
1	Entire site drains towards the northwest corner of subject parcel

There are 2 stormwater storage or containment areas are on the project site. Stormwater storage or containment areas are shown on the Site Maps in Appendix B and Table 7.3 identifies each stormwater storage or containment area by location.

Table 7.3 Stormwater Storage and Containment Areas

Location No.	Location
East of Basketball Court	Raingarden located immediately east of the proposed basketball court
West of Driveway	Raingarden located in the landscaping west of the proposed horseshoe shaped driveway and parking area

There is 1 discharge location on the project site. Site stormwater discharge location is shown on the Site Maps in Appendix B and Table 7.4 identifies each stormwater discharge location.

Table 7.4 Site Stormwater Discharge Locations

Location No.	Location
Existing 15" Storm drain	Approximately 180' from northwest property corner

7.7 Water Quality Sampling and Analysis

7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Stormwater Runoff Discharges

This Sampling and Analysis Plan for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in stormwater runoff discharges from the project site.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The following construction materials, wastes, or activities, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operational locations are shown on the Site Maps in Appendix B.

- Soil Excavation
- Stockpiling of Soil
- Off-Haul of Soil
- General Grading
- Construction Equipment Fueling and Maintenance

The following existing site features, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Locations of existing site features contaminated with non-visible pollutants are shown on the Site Maps in Appendix B.

- NONE

The following soil amendments have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil and will be used on the project site. Locations of soil amendment application are shown on the Site Maps in Appendix B.

- NONE

7.7.1.3 Monitoring Preparation
Non-visible pollutant samples will be collected by:

Contractor/QSP	☒ Yes	☐ No
Consultant	☐ Yes	☐ No
Laboratory	☐ Yes	☐ No

Samples on the project site will be collected by the following contractor or project QSP sampling personnel:

To be determined once contractor is selected

Name/Telephone Number:

Alternate(s)/Telephone Number:

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site prior to a sampling event. Monitoring supplies and

equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, clean powder-free nitrile gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, and *Effluent Sampling Field Log Sheets* and Chain of Custody (CoC) forms, which are provided in CSMP Attachment 3 "Example Forms".

7.7.1.4 Analytical Constituents

Table 7.11 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 7.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Common Non-Visible Pollutants and Water Quality Indicator Constituents Worksheet	
General Work Activity/Potential Pollutants	**Water Quality Indicators of Potential Constituents** (Review product literature and Material Safety Data Sheets to confirm potential constituents)
Adhesives	COD, Phenols, SVOCs
Asphalt Work	VOCs
Cleaning	
Acids	pH
Bleaches	Residual chlorine
TSP	Phosphate
Solvents	VOCs, SVOCs
Detergents	MBAS
Concrete / Masonry Work	
Sealant (Methyl methacrylate)	SVOC
Curing compounds	VOCs, SVOCs, pH
Ash, slag, sand	pH, Al, Ca, Va, Zn
Grading / Earthworks	
Gypsum / Lime amendments	pH
Contaminated Soil	Constituents specific to known contaminants, check with Laboratory
Landscaping	
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Fertilizers	TKN, NO_3, BOD, COD, DOC, Sulfate, NH_3,

Table 7.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Common Non-Visible Pollutants and Water Quality Indicator Constituents Worksheet	
General Work Activity/Potential Pollutants	**Water Quality Indicators of Potential Constituents** (Review product literature and Material Safety Data Sheets to confirm potential constituents)
	Phosphate, Potassium
Aluminum sulfate	Al, TDS, Sulfate
Liquid Waste	Constituents specific to materials, check with Laboratory
Lacquers, varnishes, enamels	COD, VOCs, SVOCs
Sealants	COD
Adhesives	Phenols, SVOCs
Planting / Vegetation Management	
Vegetation stockpiles	BOD
Fertilizers	TKN, NO_3, BOD, COD, DOC, sulfate, NH_3, Phosphate, Potassium
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Sanitary Waste Sewer line breaks and Portable Toilets (using clear fluid – blue fluid is visible if discharged)	BOD, Total/Fecal coliform
Soil Preparation / Amendments/Dust Control	
Polymer/Co-polymers	TKN, NO_3, BOD, COD, DOC, Sulfate, Ni
Lignin sulfate	TDS, alkalinity
Psyllium	COD, TOC
Guar/Plant Gums	COD, TOC, Ni
Solid Waste (leakage)	BOD
Utility Line Testing and Flushing	Residual chlorine, chloramines
Vehicle and Equipment Use	
Batteries	Sulfuric acid; Pb, pH

Adapted from *Attachment S, Caltrans SWPPP/WPCP Preparation Manual, February 2003*, and *CASQA Construction BMP Handbook*, 2003

7.7.1.5 Sample Collection

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations shown on the Site Maps in Appendix B or in the locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" provided in Section 7.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in the Table 7.12.

Samples will be analyzed by:

To be determined once contractor is selected

Laboratory Name:

Street Address:

City, State Zip:

Telephone Number:

Point of Contact:

ELAP Certification Number:

Samples will be delivered to the laboratory by:

Driven by Contractor	☐ Yes	☐ No
Picked up by Laboratory Courier	☐ Yes	☐ No
Shipped	☐ Yes	☐ No

Table 7.12 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
Notes:						

7.7.1.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Runoff/downgradient results shall be compared with the associated upgradient/unaffected results and any associated run-on results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits the storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

7.7.2 Sampling and Analysis Plan for pH and Turbidity in Stormwater Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is not required for Risk Level 1 projects.

7.7.3 Additional Monitoring Following an NEL Exceedance

This project is not subject to NELs.

7.7.4 Sampling and Analysis Plan for Non-Stormwater Discharges

This project is not subject to the non-stormwater sampling and analysis requirements of the General Permit because it is a Risk Level 1 project.

7.7.5 Sampling and Analysis Plan for Other Pollutants Required by the Regional Water Board

The Regional Water Board has not specified monitoring for additional pollutants.

7.7.6 Training of Sampling Personnel

Sampling personnel shall be trained to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP). Training records of designated contractor sampling personnel are provided in Appendix K.

The stormwater sampler(s) and alternate(s) have received the following stormwater sampling training:

To be completed by the contractor, QSP or sampler(s) once selected

Name	Training

The stormwater sampler(s) and alternates have the following stormwater sampling experience:

Name	Experience

7.7.7 Sample Collection and Handling

7.7.7.1 Sample Collection

Samples shall be collected at the designated sampling locations shown on the Site Maps and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP).

Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water.

(Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;

- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

i. For small streams and flow paths, simply dip the bottle facing upstream until full.
ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
iv. Avoid collecting samples from ponded, sluggish or stagnant water.
v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream, but filled indirectly from the collection container.

7.7.7.2 Sample Handling

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The

General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

To be determined once contractor is selected

Laboratory Name:

Address:

City, State Zip:

Telephone Number:

Point of Contact:

7.7.7.3 Sample Documentation Procedures

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the Effluent Sampling Field Log Sheet.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

Field Log Sheets: Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

7.8 Active Treatment System Monitoring

An Active Treatment System (ATS) will be deployed on the site?

☐ Yes ☒ No

This project does not require a project specific Sampling and Analysis Plan for an ATS because deployment of an ATS is not planned.

7.9 Bioassessment Monitoring

This project is not subject to bioassessment monitoring because it is not a Risk Level 3 project.

7.10 Watershed Monitoring Option

This project is not participating in a watershed monitoring option.

7.11 Quality Assurance and Quality Control

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

7.11.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log, an Effluent Sampling Field Log Sheet are included in CSMP Attachment 3 "Example Forms".

7.11.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section 7.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.11.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in CSMP Attachment 3 "Example Forms".

7.11.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

☒ Field Duplicates at a frequency of 1 duplicate minimum per sampling event
(Required for all sampling plans with field measurements or laboratory analysis)

7.11.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.11.4.2 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- New equipment is used;
- Equipment that has been cleaned after use at a contaminated site;
- Equipment that is not dedicated for surface water sampling is used; or
- Whenever a new lot of filters is used when sampling metals.

7.11.4.3 Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ioninzed water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

7.11.4.4 Travel Blanks

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ioninzed water blanks are taken along for the trip and held unopened in the same cooler with the VOC samples.

7.11.5 Data Verification

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
  Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
  Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an

order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.

- Check laboratory QA/QC results.
  EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.
  Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent; Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and
- Review notations of any errors and actions taken to correct the equipment or recording errors.

7.12 Records Retention

All records of stormwater monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from date of submittal or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;

- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections.

CSMP Attachment 1: Weather Reports

Place printed NOAA weather forecasts in this Attachment.

CSMP Attachment 2: Monitoring Records

Place completed BMP Inspection Forms, Visual Monitoring, Effluent Sampling and Receiving Water Field Logs, Monitoring Exceptions.

CSMP Attachment 3: Example Forms

Rain Gauge Log Sheet				
Construction Site Name:				
WDID #:				
Date (mm/dd/yy)	Time (24-hr)	Initials	Rainfall Depth (Inches)	Notes:

Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***						
Date and Time of Inspection:				Report Date:		
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater

Site Information	
Construction Site Name:	
Construction stage and completed activities:	Approximate area of exposed site:

Weather and Observations			
Date Rain Predicted to Occur:		Predicted % chance of rain:	
Estimate storm beginning: _____ (date and time)	Estimate storm duration:_____ (hours)	Estimate time since last storm: _____ (days or hours)	Rain gauge reading:_____ (inches)

Observations: If yes identify location		
Odors	Yes ☐	No ☐
Floating material	Yes ☐	No ☐
Suspended Material	Yes ☐	No ☐
Sheen	Yes ☐	No ☐
Discolorations	Yes ☐	No ☐
Turbidity	Yes ☐	No ☐

Site Inspections			
Outfalls or BMPs Evaluated		**Deficiencies Noted**	
(add additional sheets or attached detailed BMP Inspection Checklists)			
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:

Corrective Actions Identified (note if SWPPP/REAP change is needed)

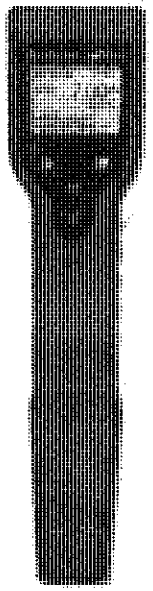
Inspector Information	
Inspector Name:	Inspector Title:
Signature:	Date:

CHAIN-OF-CUSTODY **DATE:** **Lab ID:**

DESTINATION LAB: ATTN: **ADDRESS:** **Office Phone:** **Cell Phone:**							REQUESTED ANALYSIS				Notes:
SAMPLED BY:											
Contact:											
Project Name											
Client Sample ID	**Sample Date**	**Sample Time**	**Sample Matrix**	**Container #**	**Container Type**	**Container Pres.**					
SENDER COMMENTS:							**RELINQUISHED BY**				
							Signature:				
							Print:				
							Company:				
							Date:			TIME:	
LABORATORY COMMENTS:							**RECEIVED BY**				
							Signature:				
							Print:				
							Company:				
							Date:			TIME:	

CSMP Attachment 4: Field Meter Instructions

EcoSense®



Compare to other pen-style instruments and you'll see the advantages of the pH10A

pH10A pH/Temperature

Accurate, economical pen-style measurement

The EcoSense® pH10A pen-style instrument provides an ultimate feature set over similar competitive models. The pH10A features an easy-to-use graphic interface, simple one-hand operation, memory, and low cost of ownership over the life of the product. The easy, user-replaceable electrode ensures the instrument is always ready for use. The pH10A measures pH and temperature with the following features:

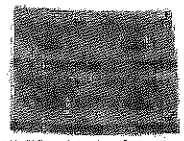
- IP-67 waterproof housing
- Automatic calibration and buffer recognition
- Automatic temperature compensation
- User-replaceable single- or double-junction electrodes
- 50-set memory (pH, temp, date and time stamp)
- GLP functionality (saves and displays last calibration data)
- 1, 2, or 3-point calibration
- "Hold" feature locks readings on display
- Graphic display with on-screen instructions
- >200 hour battery life; low battery indicator

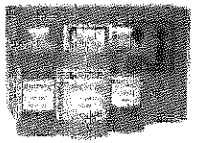
With a one-year instrument warranty and six-month electrode warranty, the pH10A will fit your needs for an easy-to-use pH instrument.

Compact design and affordable price

Ideal for aquaculture/aquariums, surface water, agriculture/hydroponics, pools/spas and wastewater applications.

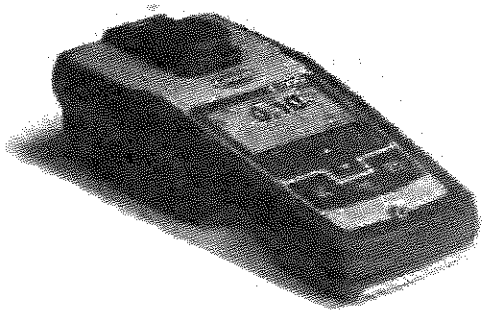
EcoSense®





2100Q Portable Turbidimeter

Easiest calibration and verification with accurate results every time!



See the 2100Q or 2100Q IS

The Hach 2100Q and 2100Q IS Portable Turbidimeters offer unsurpassed ease of use and accuracy in turbidity measurement. Only Hach offers this unique combination of advanced features, such as assisted calibration and simplified data transfer, and measurement innovation, giving you accurate results every time.

Easy Calibration and Verification

Be confident your measurements are right every time with on-screen assisted calibration and verification. You save time and get accurate results with an easy-to-follow interface that eliminates the need to reference complicated manuals in order to perform routine calibrations. Single-standard RapidCal™ calibration offers a simplified solution for low level measurements.

Simple Data Transfer

Data transfer with the 2100Q is simple, flexible, and doesn't require additional software. This feature requires the USB + Power module. All data can be transferred to the module and easily downloaded to your computer with a USB connection, providing superior data integrity and availability. With two different module options, you can customize connectivity and power to meet your specific needs.

Accuracy for Rapidly Settling Samples

The Hach 2100Q Portable Turbidimeter incorporates an innovative Rapidly Settling Turbidity™ (RST) mode to provide accurate, repeatable measurements for difficult to measure, rapidly settling samples. An exclusive algorithm that calculates turbidity based on a series of automatic readings eliminates redundant measurements and estimating.

Convenient Data Logging

Up to 500 measurements are automatically stored in the instrument for easy access and backup. Stored information includes: date and time, operator ID, reading mode, sample ID, sample number, units, calibration time, calibration status, error messages and the result.

Two Models for Specific Requirements

- 2100Q Turbidimeter – Compliant with USEPA Method 180.1 design criteria.
- 2100Q IS Turbidimeter – Compliant with ISO 70727 design criteria.

Section 8 References

Project Plans and Specifications - Refer to Submittal Package

State Water Resources Control Board (2009). Order 2009-0009-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

State Water Resources Control Board (2010). Order 2010-0014-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

Appendix A: Calculations & Reports

Figure 1. Erosivity Index Zone Map

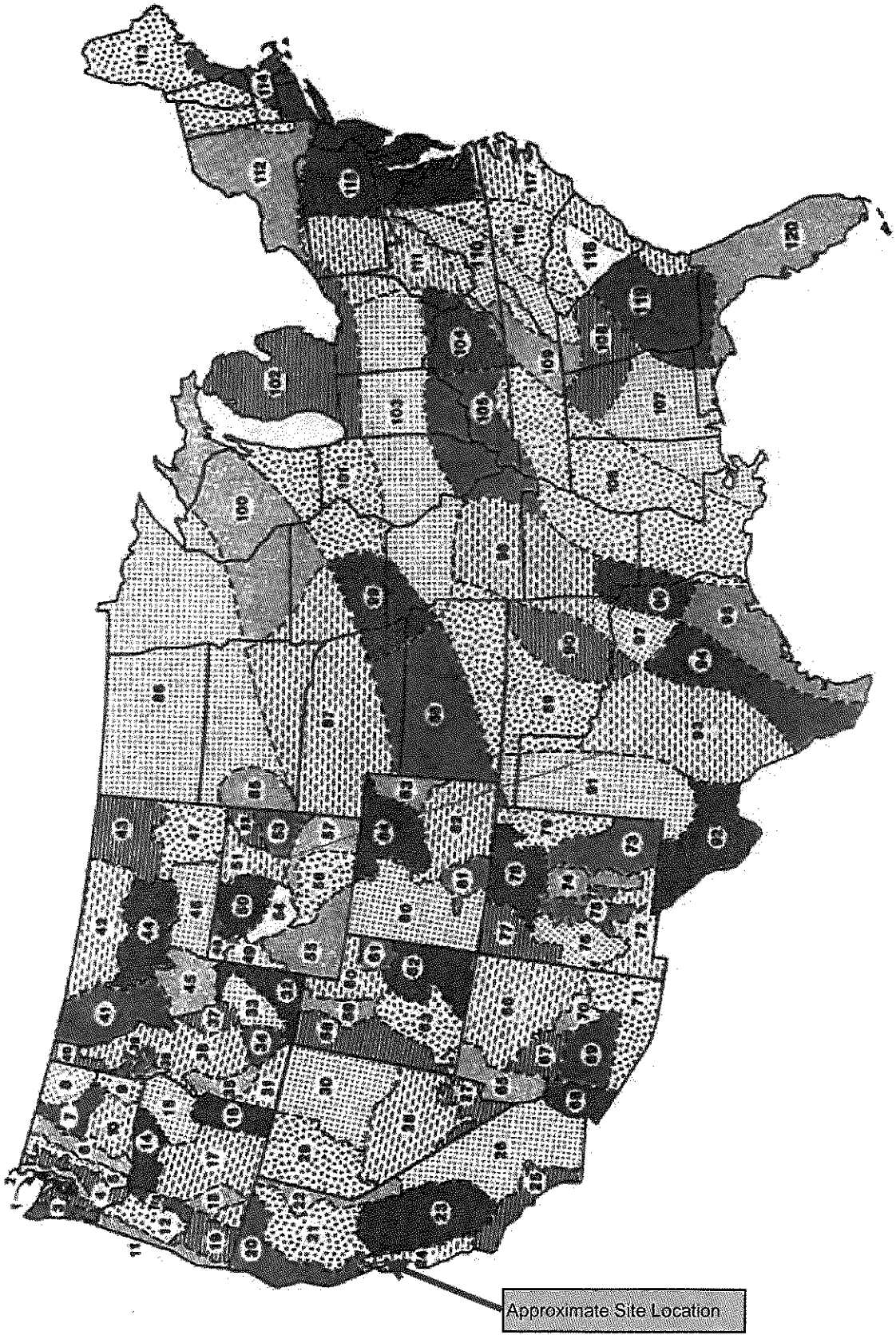
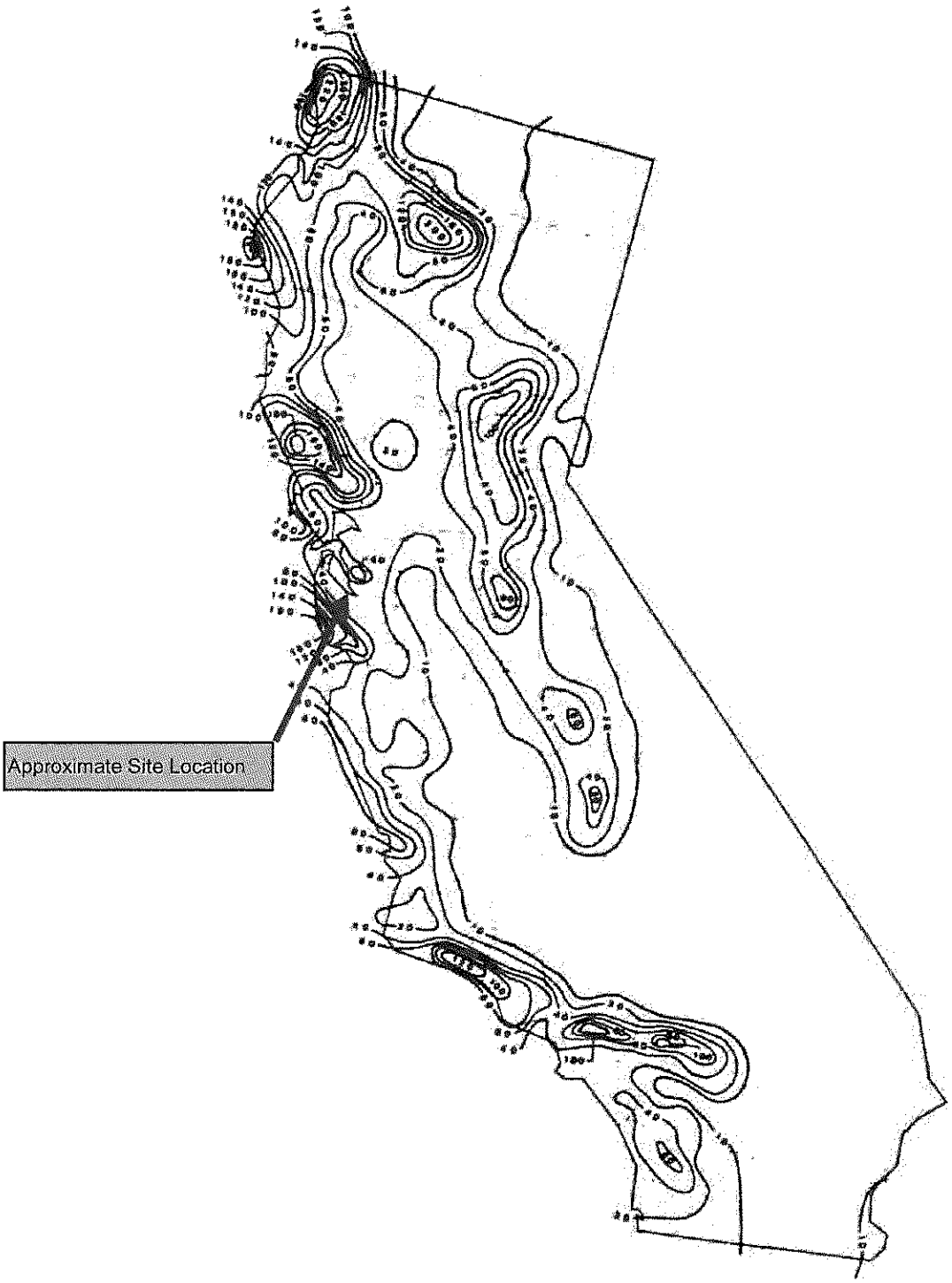


Figure 4. Isoerodent Map of California



Note: Units for all maps on this page are hundreds ft•tonf•in(ac•h•yr)$^{-1}$

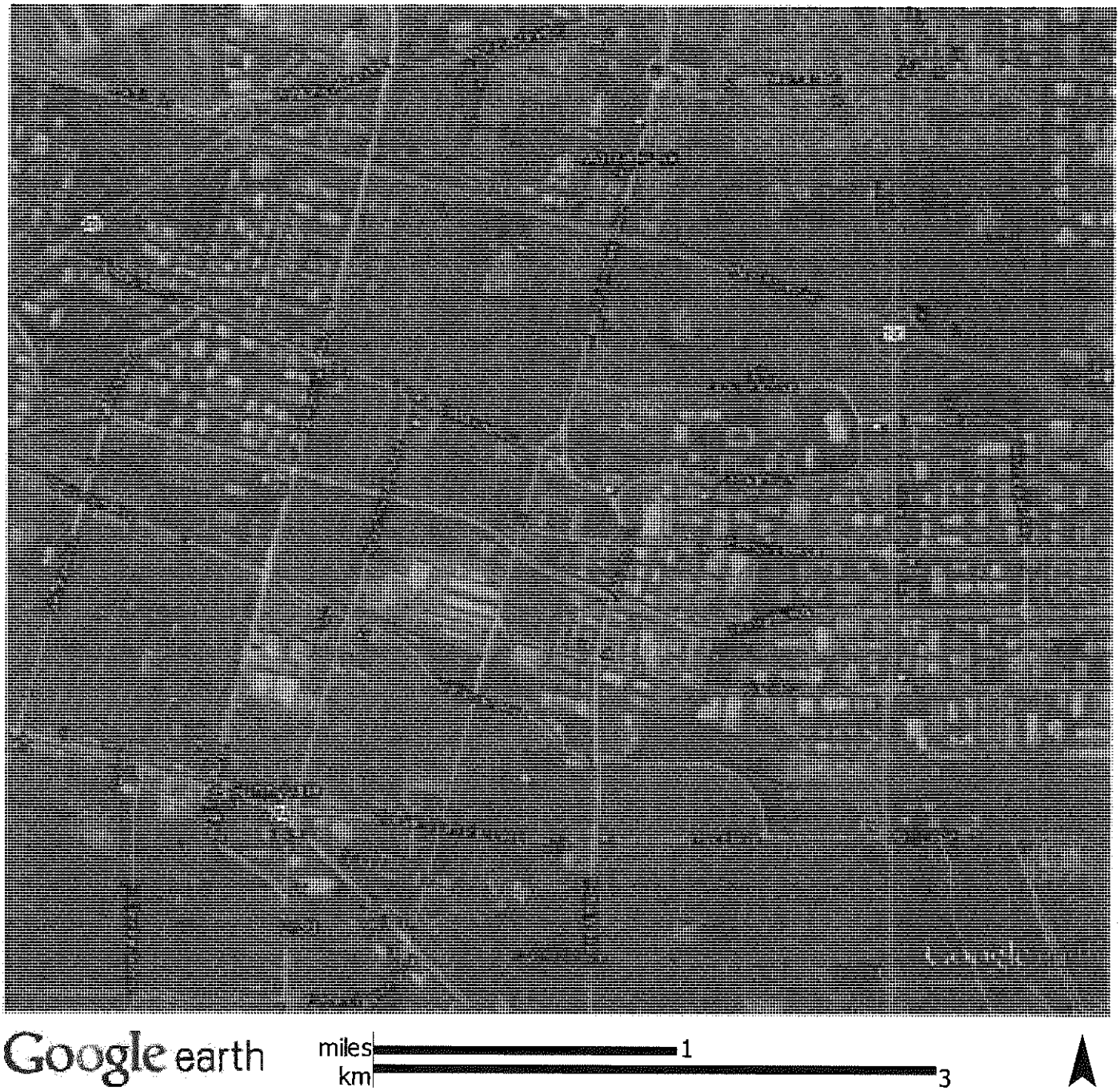
Table 1. Erosivity Index (%EI Values extracted from USDA Manual 703)

All values are at the end of the day listed below - Linear interpolation between dates is acceptable.
EI as a percentage of Average Annual R Value Computed for Geographic Areas Shown in Figure 1

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
EI Zone																									
1	0	4.3	8.3	12.8	17.3	21.6	25.1	28	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53	56	60.8	66.8	71	75.7	82	89.1	95.2	100
2	0	4.3	8.3	12.8	17.3	21.6	25.1	28.0	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53.0	56.0	60.8	66.8	71.0	75.7	82.0	89.1	95.2	100
3	0	7.4	13.8	20.9	26.5	31.8	35.3	38.5	40.2	41.6	42.5	43.6	44.5	45.1	45.7	46.4	47.7	49.4	52.8	57.0	64.5	73.1	83.3	92.3	100
4	0	3.9	7.9	12.6	17.4	21.6	25.2	28.7	31.9	35.1	38.2	42.0	44.9	48.7	48.2	50.1	53.1	56.6	62.2	67.9	75.2	83.5	90.5	96.0	100
5	0	2.3	3.6	4.7	6.0	7.7	10.7	13.9	17.8	21.2	24.5	28.1	31.1	33.1	35.3	38.2	43.2	48.7	57.3	67.8	77.9	86.0	91.3	96.9	100
6	0	0.0	0.0	0.5	2.0	4.1	8.1	12.6	17.6	21.6	25.5	29.6	34.5	40.0	45.7	50.7	55.8	60.2	66.5	75.5	85.6	95.9	99.5	99.9	100
7	0	0.0	0.0	0.0	0.0	1.2	4.9	8.5	13.9	19.0	26.0	35.4	43.9	48.8	53.9	64.5	73.4	77.5	80.4	84.8	89.9	96.6	99.2	99.7	100
8	0	0.0	0.0	0.0	0.0	0.9	3.6	7.8	15.0	20.2	27.4	38.1	49.8	57.9	65.0	75.6	82.7	86.8	89.4	93.4	96.3	99.1	100.0	100.0	100
9	0	0.8	3.1	4.7	7.4	11.7	17.8	22.5	27.0	31.4	36.0	41.6	46.4	50.1	53.4	57.4	61.7	64.9	69.7	76.0	89.6	97.4	100.0	100.0	100
10	0	0.3	0.5	0.9	2.0	4.3	9.2	13.1	18.0	22.7	29.2	39.5	46.3	48.8	51.1	57.2	64.4	67.7	71.1	77.2	85.1	92.5	96.5	99.0	100
11	0	5.4	11.3	18.8	26.3	33.2	37.4	40.7	42.5	44.3	45.4	46.5	47.1	47.4	47.8	48.3	49.4	50.7	53.6	57.5	65.5	76.2	87.4	94.8	100
12	0	3.5	7.8	14.0	21.1	27.4	31.5	35.0	37.3	39.8	41.9	44.3	45.6	46.3	46.8	47.9	50.0	52.9	57.9	62.3	69.3	81.3	91.5	96.7	100
13	0	0.0	0.0	1.8	7.2	11.9	16.7	19.7	24.0	31.2	42.4	55.0	60.0	60.8	61.2	62.6	65.3	67.6	71.6	76.1	83.1	93.3	98.2	99.6	100
14	0	0.7	1.8	3.3	6.9	16.5	26.6	29.9	32.0	35.4	40.2	45.1	51.9	61.1	67.5	70.7	72.8	75.4	78.6	81.9	86.4	93.6	97.7	99.3	100
15	0	0.0	0.0	0.5	2.0	4.4	8.7	12.0	16.6	21.4	29.7	44.5	56.0	60.8	63.9	69.1	74.5	79.1	83.1	87.0	90.9	96.6	99.1	99.8	100
16	0	0.0	0.0	0.5	2.0	5.5	12.3	16.2	20.9	26.4	36.2	48.1	58.1	63.1	66.5	71.9	77.0	81.6	85.1	88.4	91.5	96.3	98.7	99.6	100
17	0	0.0	0.0	0.7	2.8	6.1	10.7	12.9	16.1	21.9	32.8	45.9	55.5	60.3	64.0	71.2	77.2	80.3	83.1	87.7	92.6	97.2	99.1	99.8	100
18	0	0.0	0.0	0.6	2.5	6.2	12.4	16.4	20.2	23.9	29.3	37.7	45.6	49.8	53.3	58.4	64.3	69.0	75.0	86.6	93.9	96.6	98.0	100.0	100
19	0	1.0	2.6	7.4	16.4	23.5	28.0	31.0	33.5	37.0	41.7	48.1	51.1	52.0	52.5	53.6	55.7	57.6	61.1	65.8	74.7	88.0	95.8	98.7	100
20	0	9.8	18.5	25.4	30.2	35.6	38.9	41.5	42.9	44.0	46.2	48.2	50.8	51.7	52.5	54.6	57.4	58.5	60.1	63.2	69.6	76.7	85.4	92.4	100
21	0	7.5	13.6	18.1	21.1	24.4	27.0	29.4	31.7	34.6	37.3	39.9	41.6	43.4	45.4	48.1	51.3	53.3	56.6	62.4	72.4	81.3	88.9	94.7	100
22	0	1.2	1.6	1.6	1.6	1.6	1.6	2.2	3.9	4.6	6.4	14.2	32.8	47.2	58.8	69.1	76.0	82.0	87.1	96.7	99.9	99.9	99.9	99.9	100
23	0	7.9	15.0	20.9	25.7	31.1	35.7	40.2	43.2	46.2	47.7	48.8	49.4	49.9	50.7	51.8	54.1	57.7	62.8	65.9	70.1	77.3	86.8	93.5	100
24	0	12.2	23.6	33.0	39.7	47.1	51.7	55.9	57.7	58.6	58.9	59.1	59.1	59.2	59.2	59.3	59.5	60.0	61.4	63.0	66.5	71.8	81.3	89.6	100
25	0	9.8	20.8	30.2	37.6	45.8	50.6	54.4	56.0	56.8	57.1	57.1	57.2	57.6	58.5	59.8	62.2	65.3	67.5	68.2	69.4	74.8	86.6	93.0	100
26	0	2.0	5.4	9.6	15.6	21.5	24.7	26.6	27.4	28.0	28.7	29.8	32.1	36.6	44.9	55.4	65.7	72.6	77.8	84.4	89.5	93.9	96.5	98.4	100
27	0	0.0	0.0	1.0	4.0	5.9	8.0	11.1	13.9	14.0	14.6	15.3	17.0	23.2	39.1	60.0	76.3	86.1	89.7	90.4	90.9	93.1	96.6	99.1	100
28	0	0.0	0.0	0.0	0.2	0.5	1.5	3.3	7.2	11.9	17.7	21.4	27.0	37.1	51.4	62.3	70.6	78.8	84.6	90.6	94.4	97.9	99.3	100.0	100
29	0	0.6	0.7	0.7	0.7	1.5	3.9	6.0	10.5	17.9	28.8	36.6	43.8	51.5	59.3	68.0	74.8	80.3	84.3	88.8	92.7	98.0	99.6	99.9	100
30	0	0.0	0.0	0.0	0.0	0.2	0.8	2.8	7.9	14.2	24.7	35.6	45.4	52.2	58.7	68.5	77.6	84.5	88.9	93.7	96.2	97.6	98.3	99.6	100
31	0	0.0	0.0	0.0	0.0	0.2	1.0	3.6	9.9	15.7	26.4	47.2	61.4	66.9	69.0	77.2	86.0	91.6	94.8	98.7	100.0	100.0	100.0	100.0	100
32	0	0.1	0.1	0.1	0.1	0.6	2.2	4.3	9.0	14.2	23.3	34.6	46.3	54.2	61.7	72.9	82.5	89.6	93.7	98.2	99.7	99.9	99.9	99.9	100
33	0	0.0	0.0	0.0	0.0	0.6	2.3	4.2	8.8	16.1	30.0	46.9	57.9	62.8	66.2	72.1	79.1	85.9	91.1	97.0	98.9	98.9	98.9	98.9	100
34	0	0.0	0.0	0.0	0.0	1.8	7.3	10.7	15.5	22.0	29.9	35.9	42.0	48.5	56.9	67.0	76.9	85.8	91.2	95.7	97.8	99.6	100.0	100.0	100
35	0	0.0	0.0	0.0	0.0	2.5	10.2	15.9	22.2	27.9	34.7	43.9	51.9	56.9	61.3	67.3	73.9	80.1	85.1	89.6	93.2	98.2	99.8	99.8	100

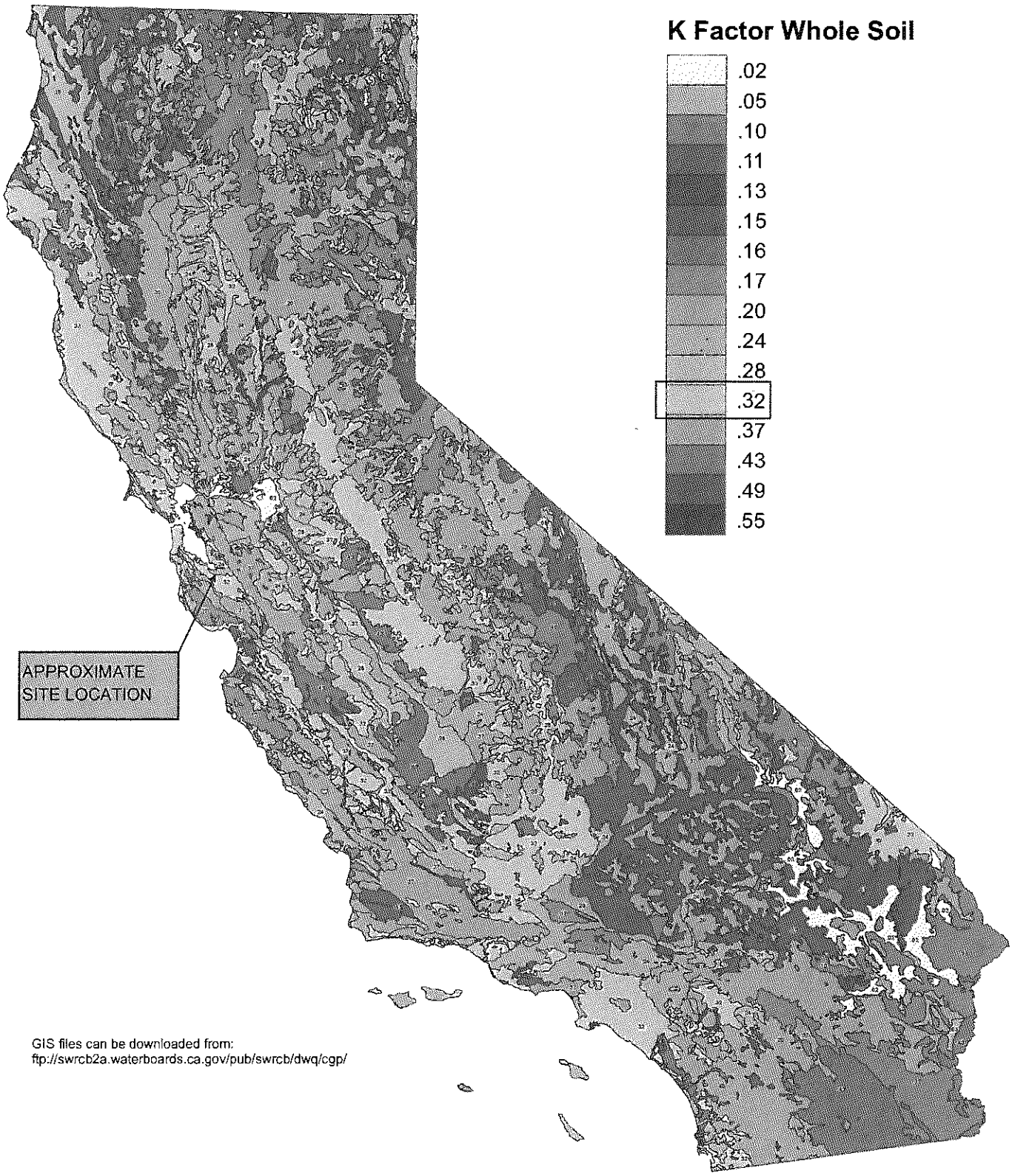
End Construction

Begin Construction



LS Factor Calculation
(Google Earth Overlay from State Waterboard website)

RUSLE K Values



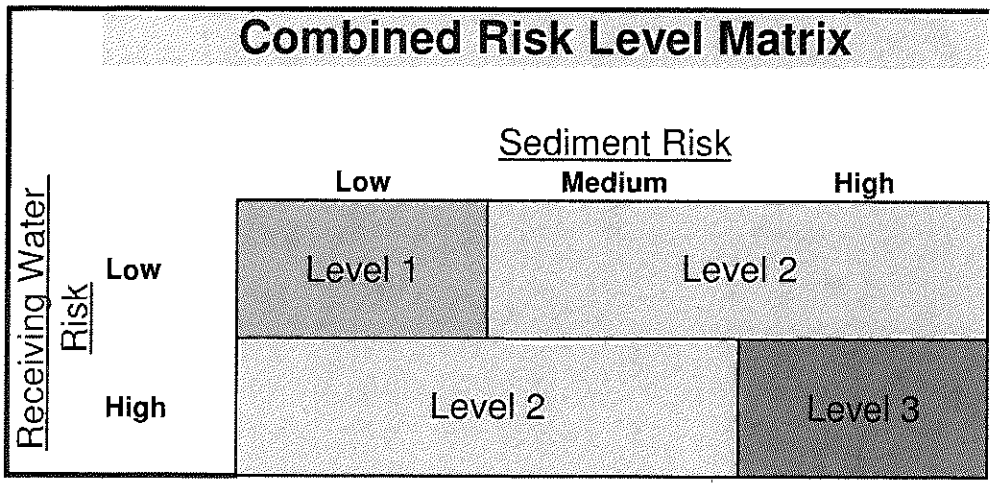
GIS files can be downloaded from:
ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/

Data Source: *Natural Resources Conservation Service, U.S. Dept. of Agriculture and State Water Resources Control Board*

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		34.8
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.32
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		0.36
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		4.00896
16	**Site Sediment Risk Factor**		
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		**Low**
19	High Sediment Risk: >= 75 tons/acre		
20			

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	**No**	**Low**
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml		
Region 1 Basin Plan Region 2 Basin Plan Region 3 Basin Plan Region 4 Basin Plan Region 5 Basin Plan Region 6 Basin Plan Region 7 Basin Plan Region 8 Basin Plan Region 9 Basin Plan		

Combined Risk Level Matrix



Project Sediment Risk: Low

Project RW Risk: Low

Project Combined Risk: Level 1

GEOTECHNICAL INVESTIGATION
MORSE PARK
Sunnyvale, California

SSA Landscape Architects, Inc.
Santa Cruz, California

26 August 2011
Project 770602501

Treadwell&Rollo
A LANGAN COMPANY

Treadwell&Rollo
A LANGAN COMPANY

26 August 2011
Project 770602501

Steven R. Sutherland, ASLA
SSA Landscape Architects, Inc.
303 Potrero Street, Suite 40-C
Santa Cruz, CA 95060

Subject: Geotechnical Investigation
Morse Park
Sunnyvale, California

Dear Mr. Sutherland:

Treadwell & Rollo is pleased to present this geotechnical investigation report for the proposed Morse Park in Sunnyvale, California. Copies have been distributed as indicated at the end of this report. This summary omits the detailed recommendations; therefore, anyone relying on the report must read it in its entirety.

The site is in the area bound by Morse Avenue to the west, private housing complexes to the north and east, and a church parking lot to the south. The site is currently occupied by five warehouse buildings surrounded by asphalt paved parking lots and landscaping. Below the pavement sections, the site is underlain by alluvial soil consisting of medium stiff to very stiff clays and sandy clays with occasional and discontinuous interbedded layers of loose to medium dense sand with varying amounts of fines. Where tested, the clay is highly expansive.

The primary geotechnical issues related to the proposed park construction are the presence of expansive near surface clays and the adequacy of shallow soil for foundation support. Conclusions and recommendations regarding the geotechnical aspects of the existing and proposed foundation elements as well as seismic hazards, site grading, drainage, excavation and backfilling of utility trenches, and pavement design are included in the report.

The recommendations contained in the report are based on a limited subsurface exploration program. Consequently, variations between expected and actual soil conditions may be found during construction. We should be retained to observe site preparation, excavation and compaction of utility trench backfill, compaction of fill, backfill and foundation subgrade, and light pole foundation installation, during which time we may make changes to our recommendations, if necessary.

We appreciate the opportunity to assist you with this project and look forward to working with you during construction.

Sincerely yours,
TREADWELL & ROLLO, A LANGAN COMPANY

Blaire Banagan
Senior Staff Engineer

Serena T. Jang
Senior Project Manager

770602501.01_STJ_Morse Park ltr

REGISTERED PROFESSIONAL ENGINEER
BLAIRE L. BANAGAN
No. C 78695
Exp. 9/30/11
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
SERENA T. JANG
No. 2702
EXP 6/30/13
GEOTECHNICAL
STATE OF CALIFORNIA

GEOTECHNICAL INVESTIGATION
MORSE PARK
Sunnyvale, California

SSA Landscape Architects, Inc.
Santa Cruz, California

26 August 2011
Project 770602501

Treadwell&Rollo
A LANGAN COMPANY

Treadwell&Rollo
A LANGAN COMPANY

TABLE OF CONTENTS

LIST OF FIGURES

APPENDIX A

APPENDIX B

APPENDIX C

Treadwell&Rollo
A LANGAN COMPANY

GEOTECHNICAL INVESTIGATION
MORSE PARK
Sunnyvale, California

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed Morse Park in Sunnyvale, California. Our services were performed in accordance to Exhibit II of the Subconsultant Agreement between SSA Landscape Architects, Inc. and Treadwell & Rollo emailed on 24 February 2011. The site location, as shown on Figure 1, is the area bound by Morse Avenue to the west, private housing complexes to the north and east, and a church parking lot to the south. The proposed park area is rectangular, with plan dimensions of approximately 530 feet long by 440 feet wide, as shown on Figure 2. The site is currently occupied by five warehouse buildings surrounded by parking lots and landscaping.

Our studies are based on the drawing titled "Conceptual Plan, Seven Seas Park, Ocean Theme" prepared by SSA Landscape Architects, the project landscape architect, as shown on Figure 3. We understand the project will include:

- a one-acre, multi-use lawn area at the north end of the site
- a walking trail bordering the north and east sides of the lawn
- play areas south of the lawn
- a sand volleyball court in the southwest corner of the site
- tennis and basketball courts northwest of the lawn
- a parking lot on the west side of the site, and
- a small structure located at the center of the site.

At this time, we understand various landscape improvements, including trees, plants and a bioswale south of the lawn area, will be constructed at the site but a grading plan is currently not available to estimate cuts or fills.

2.0 SCOPE OF SERVICES

The objectives of our investigation were to evaluate subsurface conditions at the site and geotechnical issues related to the proposed park development. We reviewed existing subsurface data at the site and further explored the subsurface conditions by drilling seven borings and performing laboratory tests on samples retrieved from the borings.

Engineering studies were performed based on the soil and groundwater conditions defined by the borings and engineering parameters developed from the laboratory testing program. On the basis of field and laboratory tests, our engineering analyses and our experience on similar projects, we developed preliminary conclusions and recommendations regarding:

- soil and groundwater conditions at the site
- the most appropriate foundation type(s) for buildings
- site seismicity and seismic hazards, including potential for fault rupture, ground shaking, liquefaction, lateral spreading and seismically induced settlements
- light pole foundations
- pavement design criteria
- site preparation and grading, including criteria for fill quality and compaction
- site grading related to demolition of existing buildings
- 2010 California Building Code (CBC) soil profile type and near-source factors
- corrosion potential of near surface soil
- construction considerations.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

We began our investigation by reviewing environmental boring logs performed by Erler & Kalinowski, Inc. (EKI) dated March 2010. To supplement the available subsurface information, we drilled seven additional test borings at the site. The approximate locations of the borings are presented on the Site Plan, Figure 2.

Prior to performing our field investigation, we:

- notified Underground Service Alert; and
- cleared the boring locations of underground utilities using an independent utility locating contractor.

3.1 Test Boring

On 17 June 2011, seven test borings, designated as B-1 through B-7, were drilled by Exploration Geoservices, Inc. using a truck-mounted, hollow-stem drill rig. The test borings were drilled to depths of 6.5 feet to 11.5 feet below the existing ground surface (bgs). Our field engineer logged the borings and obtained samples of the material encountered for visual classification and laboratory testing. Logs of the borings are presented on Figures A-1 through A-7 in Appendix A. The soil encountered in the borings was classified in accordance with the Classification Chart, presented on Figure A-8.

Soil samples were obtained using two driven split-barrel samplers. The sampler types are as follows:

- Sprague & Henwood (S&H) sampler with a 3.0-inch outside diameter and 2.5-inch inside diameter, lined with steel or brass tubes with an inside diameter of 2.43 inches
- Standard Penetration Test (SPT) sampler with a 2.0-inch outside diameter and 1.5-inch inside diameter, without liners.

The sampler types were chosen on the basis of soil type being sampled and desired sample quality for laboratory testing. In general, the S&H sampler was used to obtain samples in medium stiff to very stiff cohesive soil and the SPT sampler was used to evaluate the relative density of sandy soil.

The SPT and S&H samplers were driven with a 140-pound, down-hole safety hammer falling 30 inches. The samplers were driven up to 18 inches and the hammer blows required to drive the samplers every six inches of penetration were recorded and are presented on the boring logs. A "blow count" is defined as the number of hammer blows per six inches of penetration or less if the blow count approached 50 blows. The driving of samplers was discontinued if the observed (recorded) blow count was 50 for six inches or less of penetration. The blow counts required to drive the S&H and SPT samplers were converted to approximate SPT N-values using factors of 0.6 and 1.0, respectively, to account for sampler type and hammer energy and are shown on the boring logs. The blow counts used for this conversion

were: 1) the last two blow counts if the sampler was driven more than 12 inches, 2) the last one blow count if the sampler was driven more than six inches but less than 12 inches, and 3) the only blow count if the sampler was driven six inches or less.

Upon completion, the boreholes were backfilled with grout consisting of cement and water in accordance with the requirements of the Santa Clara Valley Water District. The soil cuttings from the borings were collected in 55 gallon drums which were stored temporarily at the site, tested, and eventually transported off-site for proper disposal.

3.2 Laboratory Testing

The soil samples recovered from the field exploration program were re-examined in the office for soil classification, and representative samples were selected for laboratory testing.

Our laboratory testing program was designed to correlate soil properties and to evaluate engineering properties of the soil at the site. Samples were tested to measure strength, moisture content, dry density, resistance value (R-value) and plasticity (Atterberg limits). The test results are presented on the boring logs and in Appendix B.

Additional laboratory testing was performed to evaluate the corrosivity of the various soil types, as corrosive soil can adversely affect underground utilities and foundation elements. A brief corrosivity evaluation is presented in Appendix C.

4.0 SITE AND SUBSURFACE CONDITIONS

According to a current project survey (Ifland, 2010), the site is generally flat, ranging from approximately Elevation 20 to 23 feet[1]. Currently, the site is occupied by five warehouse buildings with asphalt paved parking lots. Foundation drawings of the existing buildings are not available; however, based on our experience with similar structures in the area, we anticipate that they are supported by a shallow foundation system.

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1 All elevations reference NGVD 1929.

2 Highly expansive soil undergoes large volume changes with changes in moisture content.

3 Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a

Where explored, the pavement section of the parking lot consists of two-inches of asphalt concrete (AC) underlain by three- to ten-inches of aggregate base (AB). Below the pavement section, the site is underlain by alluvial deposits consisting predominantly of medium stiff to very stiff clays and sandy clays with occasional and discontinuous interbedded layers of loose to medium dense sand with varying amounts of fines. Where tested, the clay is highly expansive[2].

Groundwater was not encountered in the borings. Groundwater measurements taken from geotechnical investigations performed by our firm at nearby sites indicate that groundwater levels were encountered at approximate Elevation 0 feet. Groundwater levels fluctuate seasonally.

5.0 GEOLOGY AND SEISMICITY

5.1 Regional Geology

The site is in an area mapped as alluvial flatlands near the northern margin of the Santa Clara Valley approximately five miles southeast of San Francisco Bay. These flat lands are part of a prominent northwest-trending structural trough in the Coast Range geologic province. In the project region, the trough, which extends northward to include San Francisco Bay, separates the Santa Cruz Mountains on the southwest and the Diablo Range on the northeast. Alluvial deposits underlie much of the valley floor and, in the vicinity of the project site, exceed 500 feet in thickness (Roger and Williams, 1974)

5.2 Regional Seismicity and Faulting

The major active faults in the area are the San Andreas, San Gregorio, Hayward, and Calaveras faults. These and other faults of the region are shown on Figure 4. For each of the active faults within approximately 50 kilometers (km) of the site, the distance from the site and estimated mean characteristic Moment magnitude[3] [2007 Working Group on California Earthquake Probabilities (WGCEP) (2008) and Cao et al. (2003)] are summarized in Table 1.

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2 Highly expansive soil undergoes large volume changes with changes in moisture content.

3 Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 1
Regional Faults and Seismicity

Fault Segment	Approx. Distance from fault (km)	Direction from Site	Mean Characteristic Moment Magnitude
Monte Vista-Shannon	10.6	Southwest	6.50
Total Hayward	15	Northeast	7.00
Total Hayward-Rodgers Creek	15	Northeast	7.33
N. San Andreas – Peninsula	16	Southwest	7.23
N. San Andreas (1906 event)	16	Southwest	8.05
Total Calaveras	19	East	7.03
N. San Andreas – Santa Cruz	25	South	7.12
Zayante-Vergeles	34	South	7.00
San Gregorio Connected	35	West	7.50
Mount Diablo Thrust	41	Northeast	6.70
Greenville Connected	42	Northeast	7.00
Monterey Bay-Tularcitos	54	South	7.30

Figure 4 also shows the earthquake epicenters for events with magnitude greater than 5.0 from January 1800 through December 2000. Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836 an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale (Figure 5) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to a M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), a M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989, in the Santa Cruz Mountains with a M_w of 6.9, approximately 42 km from the site.

In 1868 an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably a M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake (M_w = 6.2).

The 2007 WGCEP at the U.S. Geologic Survey (USGS) predicted a 63 percent chance of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area in 30 years. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

TABLE 2
WGCEP (2007) Estimates of 30-Year Probability of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	31
N. San Andreas	23
Calaveras	7
San Gregorio	6
Concord-Green Valley	3
Greenville	3
Mount Diablo Thrust	1

6.0 SEISMIC HAZARDS

During a major earthquake, strong to violent ground shaking is expected to occur at the project site. Very strong ground shaking during an earthquake can result in ground failure such as that associated with soil

liquefaction[4], lateral spreading[5], cyclic densification[6], and landsliding. Each of these conditions has been evaluated based on our literature review, field investigation, and analysis, and is discussed in this section.

6.1 Ground Shaking

The seismicity of the site is governed by the activity of the Monte Vista, San Andreas, Hayward and Calaveras faults. Strong ground shaking from future earthquakes on any of the nearby faults will be felt at the site. The intensity of earthquake ground motions at the site will depend upon the characteristics of the generating fault, distance from the rupture, magnitude and duration of the earthquake, and specific subsurface conditions. We judge ground shaking at the site during a large earthquake on one of the nearby active faults will be strong to very strong.

6.2 Liquefaction and Associated Hazards

During a major earthquake, when a saturated soil with little to no cohesion liquefies, it experiences a temporary loss of shear strength as a result of a transient rise in excess pore water pressure generated by strong ground motion. Flow failure, lateral spreading, differential settlement, loss of bearing, ground fissures, and sand boils are evidence of excess pore pressure generation and liquefaction. The site is within a designated liquefaction hazard zone as designated by the California Geological Survey (CGS) seismic hazard zone map for the area titled *State of California Seismic Hazard Zones, Mountain View Quadrangle, Official Map,* dated 18 October 2006.

During this current investigation, the maximum depth explored of the borings was 11.5 feet bgs, which is several feet above the groundwater level. Therefore, the borings were not deep enough to evaluate the liquefaction potential of the site. Based on available subsurface information from nearby sites found on the USGS database (USGS, 2011) and a geotechnical investigation of a nearby site performed by Treadwell & Rollo (Treadwell & Rollo, 2008) and others, thin, non-continuous sand layers may be

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4 Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

5 Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

6 Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is densified by earthquake vibrations, causing ground-surface settlement.

encountered below the groundwater table. Based on Standard Penetration Test blow counts, cone tip resistance and laboratory test results, some of these sand layers could liquefy resulting in some settlement of the ground surface. We estimate the earthquake-induced settlement could be on the order of up to 1½ inches in some locations. The settlement is expected to be non-uniform and erratic.

6.3 Seismic Densification

Seismic densification, seismically-induced compaction or cyclic densification of non-saturated sand (i.e., sand above the groundwater table) due to earthquake vibrations may contribute to differential settlement. The soil encountered during this investigation and at nearby site above the water table is very clayey; therefore, we judge settlement from for seismic densification will be negligible.

6.4 Lateral Spreading

Lateral spreading is a phenomenon in which a surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. The surficial blocks are transported downslope or in the direction a free face, such as a channel, by earthquake and gravitational forces. Lateral spreading is generally the most pervasive and damaging type of liquefaction-induced ground failure generated by earthquakes.

The project site is relatively flat and at least ¼ mile from the closest channel. Therefore, we conclude large-scale lateral spreading is unlikely.

6.5 Fault Rupture

Historically, ground surface displacements closely follow the traces of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act. Therefore, we conclude the potential of surface rupture at the site is low.

7.0 DISCUSSIONS

On the basis of our investigation and our experience within the project area, we conclude the project is feasible from a geotechnical standpoint. Geotechnical issues of concern include:

- presence of highly expansive surface soil
- adequate foundation support
- construction considerations.

7.1 Expansive Soil

Atterberg limits tests performed on the near surface clay indicate high expansion potential. Expansive surface soil is subject to high volume changes during seasonal fluctuations in moisture content. These volume changes can cause cracking of foundations and floor slabs. Therefore, foundations and slabs should be designed and constructed to resist the effects of the expansive soil. These effects can be mitigated by moisture conditioning the expansive soil and providing select, non-expansive fill below interior and exterior slabs and supporting foundations below the zone of severe moisture change. Water from storm runoff or irrigation may cause the underlying soil to well; therefore we recommend water be drained away from building foundations and other improvements. We understand bioswales are proposed for the project. If bioswales or pervious pavers are used, the soil may heave several inches. To reduce the potential for swelling and allow for drainage the infiltration of water into the soil will need to be minimized. An impermeable liner should be used to cut off water from the native soil.

We conclude any proposed buildings at the project can be supported on individual spread or continuous footings founded 24 inches below the lowest adjacent final soil grade. Interior slabs-on-grade should be underlain by at least 15 inches of select, nonexpansive fill. Previous experience with similar soil types indicates exterior concrete slabs-on-grade should perform satisfactorily if they are supported on a layer of select fill at least six inches thick.

7.2 Foundations

We conclude that proposed structures within the park can be supported on shallow footings. Localized soft soil, if encountered under footing locations, should be excavated and recompacted.

Design recommendations for structure footings are presented in Section 8.1. Footings designed in accordance with these recommendations should settle less than ½-inch.

7.3 Soil Corrosivity

CERCO Analytical performed tests on one surficial soil sample to evaluate corrosion potential to buried metals and concrete. The results of the tests and a brief evaluation are presented in Appendix C.

On the basis of the results of the corrosivity analyses, the soil at the site is considered "corrosive." All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion. In addition, the sulfate ion concentration is sufficient to damage

reinforced concrete structures and cement mortar-coated steel; therefore, reinforced concrete structures below ground should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.50.

A corrosion engineer should be consulted regarding recommendations and details to protect against corrosion.

7.4 Construction Considerations

If underground utilities exist at the site they should be removed or properly abandoned. Any loose, weak existing utility trench backfill material that may be encountered during future site grading should be removed and replaced with properly compacted fill. Existing foundations should be completely removed beneath new utilities, pavements, sidewalks, and landscaped areas.

The soil at the site consists mainly of clay, sand and gravel that can be excavated with conventional earth-moving equipment such as loaders and backhoes. We do not anticipate that construction dewatering will be required for any shallow foundation excavations.

The upper soil is clayey, highly expansive and has a very low permeability. If site grading is performed during wet weather, the exposed soil subgrade may become wet and difficult to compact. The grading contractor should be prepared to repair weak and wet subgrade, if required.

8.0 RECOMMENDATIONS

From a geotechnical standpoint, the site can be developed as planned, provided the recommendations presented in this section of the report are incorporated into the design and contract documents. Criteria for foundation design, together with recommendations for site preparation, floor slabs, fill placement and seismic design are presented in this section of the report.

8.1 Site Preparation and Grading

Demolition in areas to be developed should include removal of existing pavement and underground obstructions, including foundations of existing structures. Any vegetation and organic topsoil should be

stripped in areas to receive new site improvements. Stripped organic soil can be stockpiled for later use in landscaped areas, if approved by the owner and architect; organic topsoil should not be used as compacted fill.

Demolished asphalt and concrete at the site may be crushed to provide recycled construction materials, including sand, free-draining crushed rock, and Class 2 aggregate base (AB). Where recycled Class 2 AB will be used beneath pavements, it should meet requirements of the Caltrans Standard Specifications.

Existing underground utilities beneath areas to receive new improvements should be removed or abandoned in-place by filling them with grout. The procedure for in-place abandonment of utilities should be evaluated on a case-by-case basis, and will depend on location of utilities relative to new improvements. However, in general, existing utilities within four feet of final grades should be removed, and the resulting excavation should be properly backfilled.

We recommend that at least 15 inches of imported (select/non-expansive) material should be placed below the bottom of slabs for proposed park structures. The select fill should extend at least five feet beyond the structure's footprint. Prior to placement of select fill, the onsite soil exposed by stripping should be scarified to a depth of at least 12 inches, moisture-conditioned to at least three percent above optimum moisture content, and compacted to between 88 and 93 percent relative compaction[7]. The soil subgrade should be kept moist until it is covered by select fill. If site grading occurs in late summer or in fall, the surface soil may be dry to depths exceeding 12 inches. Therefore, prior to grading, we should perform moisture content tests in the upper three feet of soil beneath building areas.

We recommend at least six inches of imported (select/non-expansive) material be placed beneath proposed exterior concrete flatwork, including patio slabs and sidewalks; the select fill should extend at least two feet beyond the slab edges. The upper 12 inches of native soil in exterior slab areas should be moisture-conditioned to at least three percent above optimum moisture content and compacted to between 88 and 93 percent relative compaction.

7 Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557-07 laboratory compaction.

Select fill should consist of imported soil that is free of organic matter, contain no rocks or lumps larger than three inches in greatest dimension, have a low corrosion potential[8], have a liquid limit less than 40 and plasticity index less than 12, and be approved by the geotechnical engineer. In addition, the select fill should contain at least 20 percent fines (particles passing the No. 200 sieve) to reduce the potential for surface water to infiltrate beneath slabs. In general, the existing near surface soil is not expected to meet the criteria for select fill. Select fill should be placed in lifts not exceeding eight inches in loose thickness, moisture-conditioned to near optimum moisture content, and compacted to at least 90 percent relative compaction. Samples of proposed select fill material should be submitted to the geotechnical engineer at least three business days prior to use at the site.

8.2 Foundations

The following subsections provide recommendations for park structure and light pole foundations.

8.2.1 Park Structure

Proposed park structure should be supported on shallow, spread footings bearing on firm, native soil or engineered fill. The bottom of the footings should be embedded at least 24 inches below the lowest adjacent soil subgrade and should be at least 18 inches wide for continuous footings and 24 inches for isolated spread footings. Footings adjacent to utility trenches (or other footings) should bear below an imaginary 1.5:1 (horizontal to vertical) plane projected upward from the bottom edge of the utility trench (or adjacent footings).

For the recommended minimum embedment, the footings bearing on firm native soil may be designed for an allowable bearing pressure of 2,000 pounds per square foot (psf) for dead plus live loads, with a one-third increase for total loads, including wind and/or seismic loads. We estimate total settlements will be up to ½-inch.

Lateral loads on footings can be resisted by a combination of passive resistance acting against the vertical faces of the footings and friction along the bases of the footings. We recommend a passive resistance be calculated using a lateral pressure corresponding to an equivalent fluid weight of 300 pcf;

[8] Low corrosion potential is defined as a minimum resistivity of 2,000 ohms-cm and maximum sulfate and chloride concentrations of 250 parts per million.

the upper foot of soil should be ignored unless confined by a concrete slab or pavement. Frictional resistance should be computed using a base friction coefficient of 0.30. The passive resistance and base friction values include a factor of safety of about 1.5 and may be used in combination without reduction.

Uplift loads may be resisted by the weight of the footing and any overlying soil. If footings are inadequate to provide the necessary uplift resistance, drilled piers or anchors may be used. If drilled piers or anchors are required, we can provide design recommendations.

Weak soil or non-engineered fill encountered in the bottom of footing excavations should be excavated and replaced with engineered fill or lean concrete. The bottoms and sides of the footing excavations should be wetted following excavation and maintained in a moist condition until concrete is placed. We should check footing excavations prior to placement of reinforcing steel. Footing excavations should be free of standing water, debris, and disturbed materials prior to placing concrete.

Positive surface drainage should be provided around the structures to direct surface water away from the foundations. In addition, roof downspouts should be discharged into controlled drainage facilities to keep the water away from the foundations.

8.2.2 Light Pole Foundations

Light pole foundations may be designed in accordance with the 2010 California Building Code (CBC), using lateral soil bearing pressure of 150 pcf, as designated for Class 4 material.

8.3 Flexible Pavement Design Criteria

The State of California resistance value (R-value) method for flexible pavement design was used to develop recommendations for the asphalt pavement sections. We have provided pavement sections for traffic indices of 4.0, 5.0, and 6.0. Actual traffic indices should be determined through a traffic engineer's analysis of expected automobile and truck traffic at the site.

Laboratory tests results indicate the on-site soil has an R-value of 5. Flexible pavement sections are presented in Table 3 and are based on an R-value of 5. During construction, the R-value of the actual subgrade soil should be re-evaluated.

TABLE 3
Recommended Flexible Pavement Sections

TI	Asphalt Concrete (inches)	Class 2 Aggregate Base (R = 78) (inches)
4.0	3.0	7.0
5.0	3.0	10.0
6.0	5.0	10.0

Pavement components should conform to the current Caltrans Standard Specifications. The upper six inches of the soil subgrade in pavement areas should be moisture-conditioned to above optimum and compacted to at least 90 percent relative compaction and rolled to provide a smooth non-yielding surface. The subgrade should be kept moist until covered with aggregate base to avoid shrinkage cracks from forming. Aggregate base should conform to Section 26-1.02A of the current Caltrans Standard Specifications. Aggregate base should be compacted to at least 95 percent relative compaction.

8.4 Concrete Pavements

Concrete pavement design is based on a maximum single-axle load of 20,000 pounds and a maximum tandem axle of 32,000 pounds. The recommended rigid pavement section for these axle loads is six inches of Portland cement concrete over six inches of Class 2 aggregate base. The pavement section should rest on at least six inches of select fill.

The modulus of rupture of the concrete should be at least 500 psi at 28 days. Contraction joints should be constructed at 15-foot spacing. Where the outer edge of a concrete pavement meets asphalt pavement, the concrete slab should be thickened by 50 percent at a taper not to exceed a slope of 1 in 10. Recommendations for subgrade preparation and aggregate base compaction for concrete pavement are the same as those we have described for asphalt pavement (Section 8.3).

Exterior concrete slabs such as sidewalks should be supported on compacted subgrade and at least six inches of select fill consisting of Class 2 aggregate base. The subgrade and baserock should be compacted to at least 90 percent relative compaction and provide a smooth, non-yielding surface for support of the concrete slabs. Sidewalks should be reinforced with a minimum of #3 bars at 24 inches on center. Even with six inches of select fill, these slabs may experience some cracking due to shrinking

and swelling of the underlying expansive soil. Thickening the slabs and adding additional reinforcement will control this cracking to some degree. In addition, where slabs provide access to buildings, it would be prudent to dowel the slab to the entrance of the building to permit rotation of the slab as the exterior ground shrinks and swells and to prevent a vertical offset at the entries.

8.5 Utility Trenches

Excavations for utility trenches can be readily made with a backhoe. Despite careful site preparation, unexpected obstructions may make some of the trenching operations difficult. All trenches should conform to the current CAL-OSHA requirements.

Backfill for utility trenches and other excavations is also considered fill, and it should be compacted according to the recommendations presented in Section 8.1. If imported clean sand or gravel is used as backfill, however, it should be compacted to at least 95 percent relative compaction. If native soil is used for trench backfill, it should be placed in lifts of eight inches or less, moisture-conditioned to at least three percent above optimum moisture content, and compacted to between 88 and 93 percent relative compaction. Jetting of trench backfill should not be permitted. Special care should be taken when backfilling utility trenches in pavement areas. Poor compaction may cause excessive settlements, resulting in damage to the pavement section.

To provide uniform support, pipes or conduits should be bedded on a minimum of four inches of sand or fine gravel. After the pipes and conduits are tested, inspected (if required) and approved, they should be covered to a depth of six inches with sand or fine gravel, which should be mechanically tamped.

Where utility trenches backfilled with sand or gravel enter the building pads, an impermeable plug consisting of native clay or lean concrete, at least five feet in length, should be installed at the building line. Further, where sand- or gravel-backfilled trenches cross planter areas and pass below asphalt or concrete pavements, a similar plug should be placed at the edge of the pavement. The purpose of these plugs is to reduce the potential for water to become trapped in trenches beneath the building or pavements. This trapped water can cause heaving of soils beneath slabs and softening of subgrade soil beneath pavements.

8.6 Site Drainage and Landscaping

Positive surface drainage should be provided around proposed park structures to direct surface water away from building foundations. To reduce the potential for water ponding adjacent to the structure, we recommend the ground surface within a horizontal distance of five feet from the structure be designed to slope down and away from the structure with a surface gradient of at least two percent in unpaved areas and one percent in paved areas. In addition, roof downspouts should be discharged into controlled drainage facilities to keep the water away from the foundations.

The use of water-intensive landscaping around the perimeter of the proposed park structure should be avoided to reduce the amount of water introduced to the subgrade. Irrigation of landscaping around the structure should be limited to drip or bubbler-type systems. Trees with large roots or have high water demand should also be avoided since they can dry out the soil beneath foundations and cause settlement. The purpose of these recommendations is to avoid large differential moisture changes adjacent to the foundations, which have been known to cause large differential movement over short horizontal distances in expansive soil, resulting in cracking of slabs and architectural damage.

To reduce the potential for irrigation water entering the pavement section, vertical curbs adjacent to landscaped areas should extend through any aggregate base and at least six inches into the underlying soil. In heavily watered areas, such as lawns, it may also be necessary to install a subdrain behind the curb to intercept excess irrigation water.

8.6.1 Bioretention Systems

Bioretention areas are landscaping features used to treat stormwater runoff within a development site. They are commonly located in parking lot islands and landscape areas. Surface runoff is directed into shallow, landscaped depressions, which usually include mulch and a prepared soil mix. Typically, the filtered runoff is collected in a perforated underdrain beneath the bioretention system and returned to the storm drain system. For larger storms, runoff is generally diverted past the bioretention areas to the storm drain system.

The soil within a bioretention system should typically have an infiltration rate sufficient to draw down any pooled water within 48 hours after a storm event. Based on the "Bioretention Manual" prepared by The Prince George's County (2007), the infiltration rate of the bioretention soil is recommended to exceed ½ inch per hour; cohesionless soils like sand meet this criterion. Cohesive soils, such as clays and silts, do not meet the infiltration rate requirement and should be considered unsuitable in a bioretention system, particularly since they are expansive. For areas where there are unsuitable in-situ soils, the bioretention system can be created by importing a suitable soil mix and providing an underdrain. Based on our observation of the soil at the project site, the in-situ clays do not meet the infiltration rate requirements and the bioretention system will need to be constructed with imported suitable soil and include an underdrain system.

Underdrains are typically located at the invert of the bioretention system to intercept water that does not infiltrate into the surrounding soils. Underdrains consist of a perforated PVC pipe in a gravel blanket. The gravel should be virgin rock, double washed, uniformly graded and should be ½ inch to 1½ inches in diameter. To reduce infiltration of water into the underlying expansive clay, we recommend an impervious liner such as HDPE 40 mm be placed beneath the gravel blanket. The perforated PVC pipe cross-section area should be determined based on the desired hydraulic conductivity of the underdrain. The PVC pipe should be bedded on two to three inches of gravel and covered with gravel and a filter fabric (Mirafi 140NC or equivalent).

Because of the presence of near surface expansive soil, bioretention systems should be set back a minimum of five feet from building foundations, slabs, concrete flatwork or pavements. Overflow from bioretention areas should be directed to the storm drain system away from building foundations and slabs.

Typically, the bottom of the bioretention system is recommended to be a minimum of two feet or more above the groundwater table.

8.7 2010 California Building Code Mapped Values

For seismic design in accordance with the provisions of 2010 California Building Code (CBC), we recommend the following:

- Maximum Considered Earthquake (MCE) S_s and S_1 of 1.50g and 0.60g, respectively.
- Site Class D
- Site Coefficients F_A and F_V of 1.0 and 1.5
- Maximum Considered Earthquake (MCE) spectral response acceleration parameters at short periods, S_{MS}, and at one-second period, S_{M1}, of 1.50g and 0.90g, respectively.
- Design Earthquake (D_E) spectral response acceleration parameters at short period, S_{DS}, and at one-second period, S_{D1}, of 1.00g and 0.60g, respectively.

9.0 CONSTRUCTION MONITORING

We should be retained to review final grading and improvement plans. During construction, we should observe site preparation, preparation of subgrades for buildings and concrete flatwork, excavation and compaction of utility trench backfill, compaction of fill, excavations for footings, and light pole foundation installation. These observations will allow us to compare actual with anticipated soil conditions and to check that the contractor's work conforms with the geotechnical aspects of the plans and specifications.

10.0 LIMITATIONS

The conclusions and recommendations presented in this report result from limited engineering studies based on our interpretation of the existing geotechnical conditions and available subsurface data. Actual subsurface conditions may vary. If any variations or unforeseen conditions are encountered during construction, or if the proposed construction will differ from that which is described in this report, Treadwell & Rollo, Inc. should be notified so that supplemental recommendations can be made.

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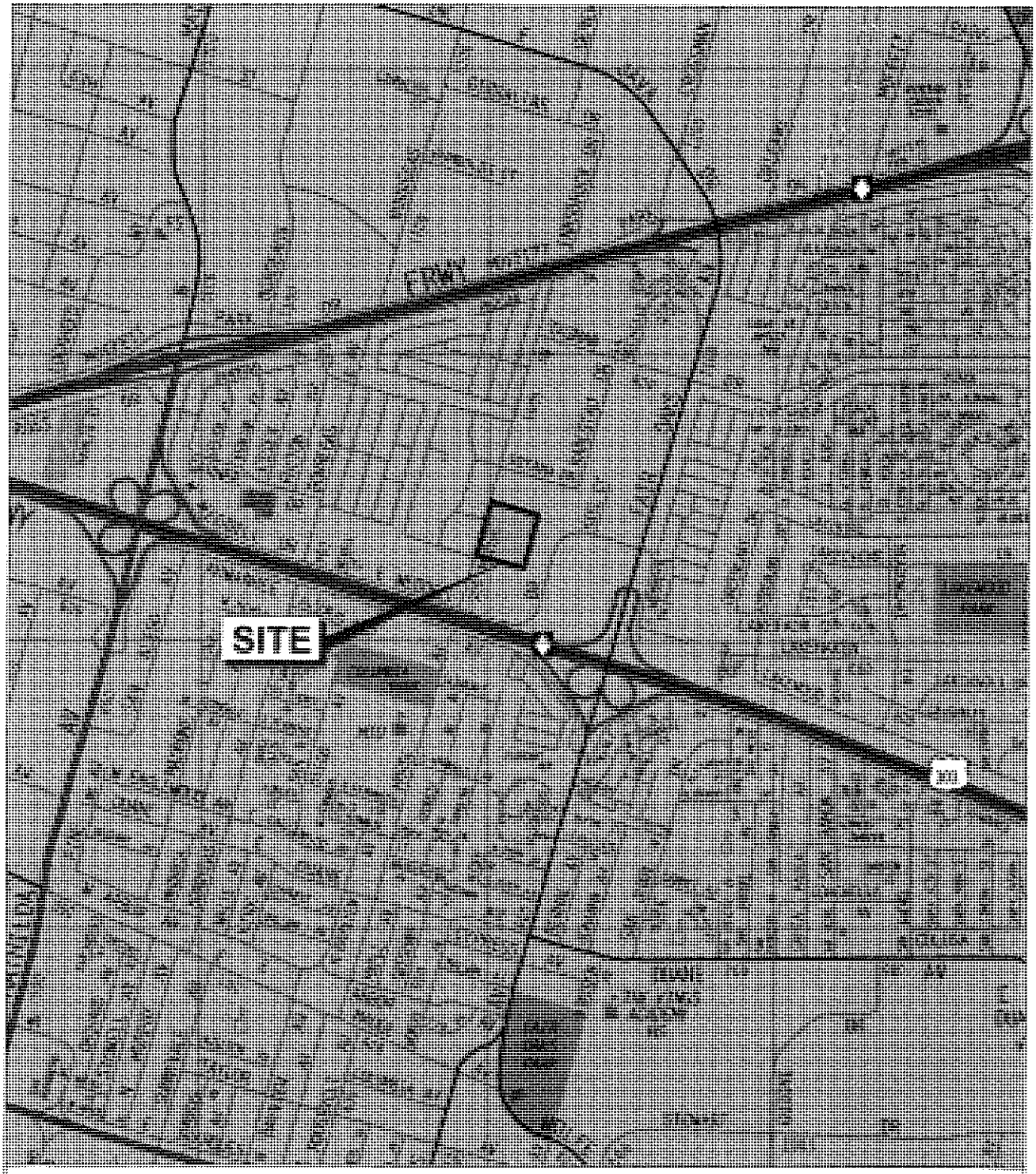
FIGURES



Base map: The Thomas Guide
San Francisco County
1998

0 1/4 1/2 Mile

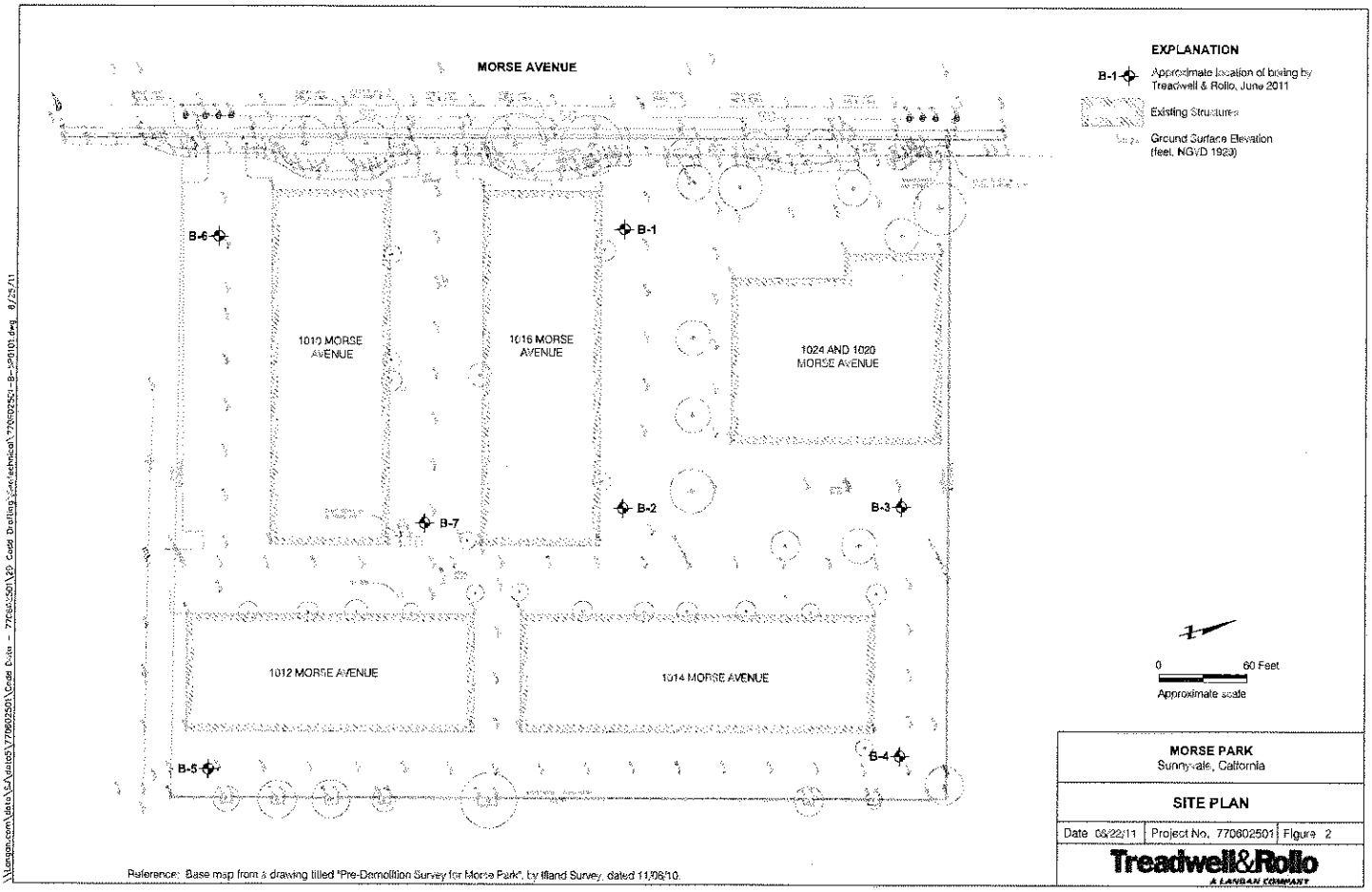
Approximate scale

MORSE PARK
Sunnyvale, California

SITE LOCATION MAP

Treadwell&Rollo
A Langan company

Date 06/27/11	Project No. 770602301	Figure 1



Reference: Base map from a drawing titled "Pre-Demolition Survey for Morse Park", by Bland Survey, dated 11/08/10.

MORSE PARK
Sunnyvale, California

SITE PLAN

Date 08/22/11	Project No. 770602501	Figure 2

Treadwell&Rollo
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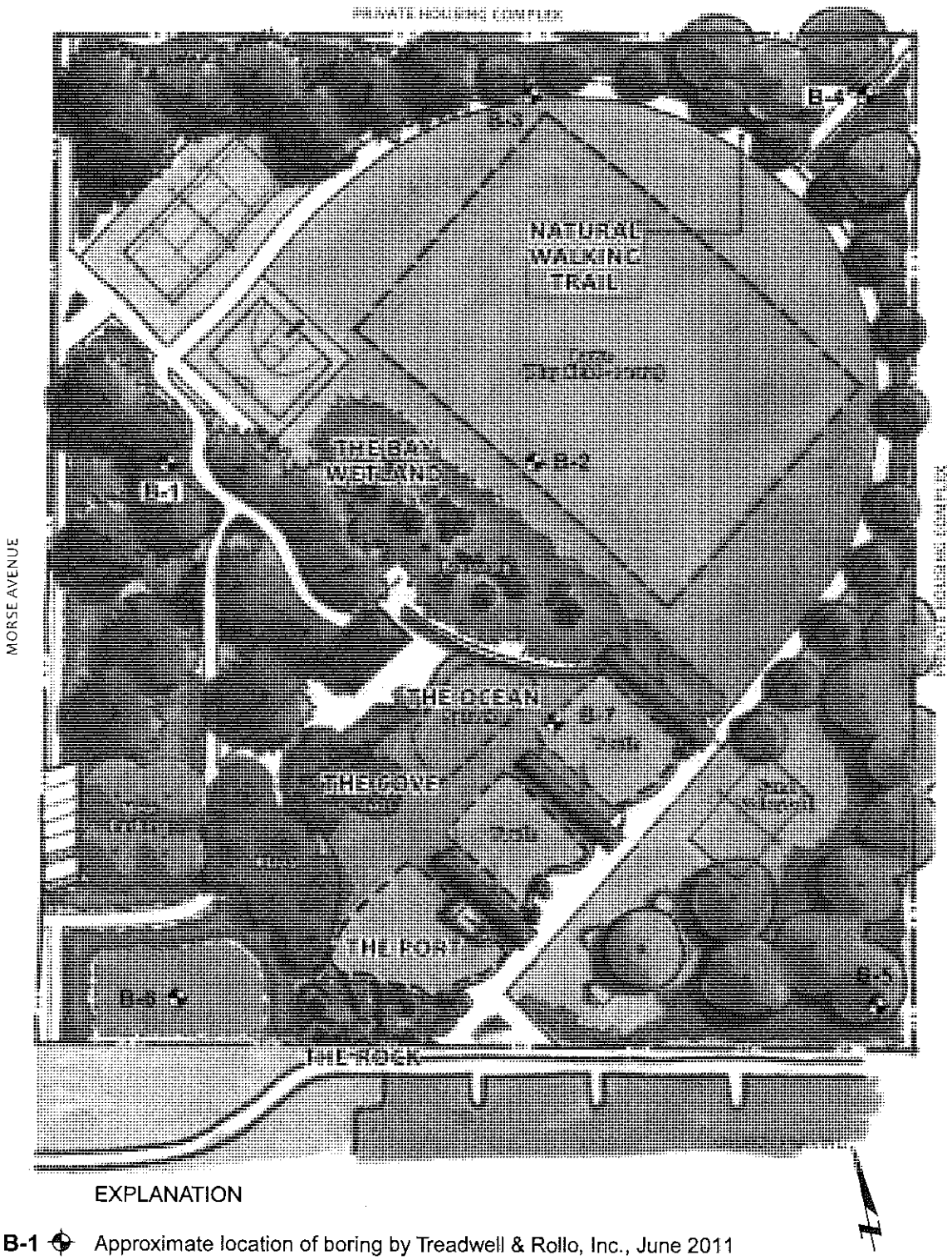

EXPLANATION

B-1 ⊕ Approximate location of boring by Treadwell & Rollo, Inc., June 2011

0 80 Feet

Approximate scale

Base map: Drawing titled "Conceptual Plan" by SSA Landscape Architects, dated April 2011.

MORSE PARK
Sunnyvale, California

PROPOSED DEVELOPMENT PLAN

Treadwell&Rollo
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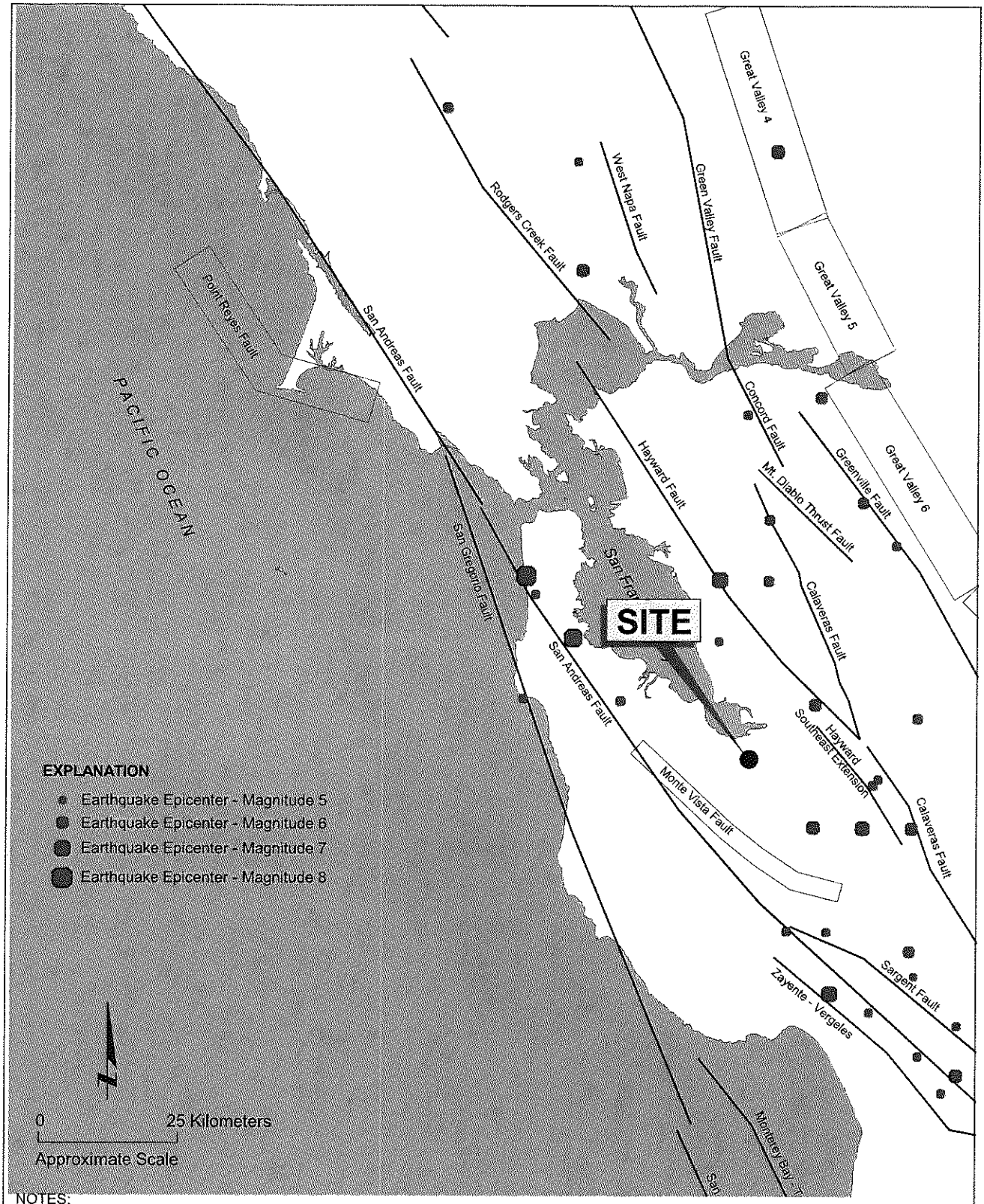
Date 08/22/11	Project No. 770602501	Figure 3



NOTES:
Digitized data for fault coordinates and earthquake catalog was developed by the California Department of Conservation Division of Mines and Geology. The historic earthquake catalog includes events from January 1800 to December 2000.

MORSE PARK
Sunnyvale, California

MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS IN THE SAN FRANCISCO BAY AREA

Treadwell&Rollo
A LANGAN COMPANY

Date 08/22/11	Project No. 770602501	Figure 4

I **Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced.**
Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.

II **Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons.**
As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.

III **Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases.**
Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.

IV **Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside.**
Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeably.

V **Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors.**
Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerably. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.

VI **Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors.**
Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows break. Knickknacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.

VII **Frightens everyone. General alarm, and everyone runs outdoors.**
People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.

VIII **General fright, and alarm approaches panic.**
Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters varies. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures. Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

IX **Panic is general.**
Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings - some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.

X **Panic is general.**
Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.

XI **Panic is general.**
Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.

XII **Panic is general.**
Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

MORSE PARK
Sunnyvale, California

MODIFIED MERCALLI INTENSITY SCALE

Treadwell&Rollo
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Date 08/22/11 | Project No. 770602501 | Figure 5

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APPENDIX A

Test Boring Logs

PROJECT: **MORSE PARK**
Sunnyvale, California

Log Boring B-1

Boring location: See Site Plan, Figure 2 | Logged by: W. Stegerstrom

Date started: 6/17/11 | Date finished: 6/17/11

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						Ground Surface Elevation: 22.1 feet[2]						
0						2-inches Asphalt Concrete (AC)						
0.5						4-inches Aggregate Base (AB)						
1						CLAY (CL) gray, stiff, dry to moist, trace rootlets						
3	S&H		5 10 11	13	CL		PP		1,200			
5	S&H		5 12 13	15		olive-gray, trace fine sand						
7						CLAY with SAND (CL) light olive, stiff, moist, fine sand						
8	S&H		7 1 12	14	CL		PP		2,800			
10	S&H		6 10 10	12	SC	CLAYEY SAND (SC) light olive with light yellow mottling, medium dense, moist, trace fine gravel	PP		3,500			

Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H blow counts for the last two increments were converted to SPT N-Values using a factor of 0.6, to account for sampler type and hammer energy.
[2] Elevations based on NGVD 1929 and taken from "Pre-Demolition Survey for Morse Park", by Ifland Survey, dated 11/16/10.

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Project No.: 770602501 | Figure: A-1

TEST GEOTECH LOG 770602501.GPJ TR.GDT 8/25/11

PROJECT: **MORSE PARK**
Sunnyvale, California

Log of Boring B-2

Boring location: See Site Plan, Figure 2 | Logged by: W. Stegerstrom

Date started: 6/17/11 | Date finished: 6/17/11

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						Ground Surface Elevation: 22 feet[2]						
0						2-inches Asphalt Concrete (AC)						
1						4-inches Aggregate Base (AB)						
2						CLAY (CL) olive-gray, very stiff, dry to moist, with trace rootlets, trace fine sand						
3	S&H		10 18 20	23	CL		TxUU	300	2,860		17.9	103
4												
5						yellow-olive, trace fine gravel						
6	S&H		12 18 15	17								
7												
8												
9												
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Boring terminated at a depth of 6.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H blow counts for the last two increments were converted to SPT N-Values using a factor of 0.6, to account for sampler type and hammer energy.
[2] Elevations based on NGVD 1929 and taken from "Pre-Demolition Survey for Morse Park", by Ifland Survey, dated 11/16/10.

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Project No.: 770602501 | Figure: A-2

TEST GEOTECH LOG 770602501.GPJ TR.GDT 8/25/11

PROJECT: **MORSE PARK**
Sunnyvale, California

Log of Boring B-3

Boring location: See Site Plan, Figure 2 | Logged by: W. Stegerstrom

Date started: 6/17/11 | Date finished: 6/17/11

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						Ground Surface Elevation: 20.7 feet[2]						
0						2-inches Asphalt Concrete (AC)						
1						10-inches Aggregate Base (AB)						
2						CLAY (CL) olive-gray, stiff, dry to moist, trace fine gravel						
3	S&H		7 8 14	13	CL							
4												
5						trace fine light yellow sand, fine gravel						
6	S&H		8 8 7	9								
7												
8												
9												
10												
11												
12												
13												
14												
15												
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Boring terminated et a depth of 6.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H blow counts for the last two increments were converted to SPT N-Values using a factor of 0.6, to account for sampler type and hammer energy.
[2] Elevations based on NGVD 1929 and taken from "Pre-Demolition Survey for Morse Park", by Iflend Survey, dated 11/16/10.

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Project No.: 770602501 | Figure: A-3

TEST GEOTECH LOG 770602501.GPJ TR.GDT 8/25/11

PROJECT: **MORSE PARK**
Sunnyvale, California

Log of Boring B-4

Boring location: See Site Plan, Figure 2 | Logged by: W. Stegerstrom

Date started: 6/17/11 | Date finished: 6/17/11

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						Ground Surface Elevation: 21 feet[2]						
0						2-inches Asphalt Concrete (AC)						
1						5-inches Aggregate Base (AB)						
2					CL	CLAY (CL) olive-gray, very stiff, dry, trace fine sand						
3	S&H		9 12 14	16								
4												
5					SC	CLAYEY SAND (SC) light olive, medium dense, moist, fine-grained sand						
6	S&H		5 9 11	12								
7												
8	S&H		4 4 5	5	SP	SAND (SP) olive to gray, loose, moist						
9					CL	SANDY CLAY (CL) light olive, medium stiff, moist, with light iron staining						
10												
11	S&H		6 6 7	8	CL	CLAY (CL) mottled light olive and yellow-brown, medium stiff to stiff, moist, trace gravel, fine to medium sand						
12												
13												
14												
15												
16												
17												
18												
19												
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Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H blow counts for the last two increments were converted to SPT N-Values using a factor of 0.6, to account for sampler type and hammer energy.

[2] Elevations based on NGVD 1929 and taken from "Pre-Demolition Survey for Morse Park", by Ifland Survey, dated 11/16/10.

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Project No.: 770602501 | Figure: A-4

TEST GEOTECH LOG 770602501.GPJ TR.GDT 8/25/11

PROJECT: **MORSE PARK**
Sunnyvale, California

Log of Boring B-5

Boring location: See Site Plan, Figure 2 | Logged by: W. Stegerstrom

Date started: 6/17/11 | Date finished: 6/17/11

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

LABORATORY TEST DATA

DEPTH (feet)	SAMPLES: Sampler Type	Sample	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						Ground Surface Elevation: 22.6 feet[2]						
1						2-inches Asphalt Concrete (AC)						
						4-inches Aggregate Base (AB)						
2					CL	CLAY with SAND (CL)						
3	S&H		9 13 15	17		olive-brown, very stiff, dry, trace gravel, fine sand						
4												
5						SILTY SAND with GRAVEL (SM)						
6	S&H		22 26 22	29		yellow-brown, medium dense, dry to moist, weakly cemented, fine gravel up to 3/4-inch in diameter						
7					SM							
8	S&H		8 4 9	11		medium dense						
9						grades with less silt content						
10												
11	SPT		12 8 4	12	SP-SM	SAND with SILT (SP-SM) yellow and gray mottling, medium dense, moist, fine to medium-grained, trace fine gravel						
12												
13												
14												
15												
16												
17												
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Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.6 and 1.0, respectively to account for sampler type and hammer energy.

[2] Elevations based on NGVD 1929 and taken from "Pre-Demolition Survey for Morse Park", by Ifland Survey, dated 11/16/10.

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Project No.: 770602501 | Figure: A-5

TEST GEOTECH LOG 770602501.GPJ TR.GDT 8/25/11

PROJECT: **MORSE PARK**
Sunnyvale, California

Log of Boring B-6

Boring location: See Site Plan, Figure 2 | Logged by: W. Stegerstrom

Date started: 6/17/11 | Date finished: 6/17/11

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H)

LABORATORY TEST DATA

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						Ground Surface Elevation: 22.8 feet[2]						
0						2-inches Asphalt Concrete (AC)						
1						3-inches Aggregate Base (AB)						
2						CLAY (CL) gray, stiff, moist, trace fine sand						
3	S&H		9 10 10	12	CL							
4												
5						grades gray-brown						
6	S&H		8 12 15	16		grades to olive-gray, very stiff, trace gravel						
7												
8	S&H		4 5 8	8		CLAY (CL) olive-yellow, medium stiff, wet, with interbedded sand layers						
9					CL							
10												
11	S&H		5 5 8	8		black mottling, wet, increase in sand content						
12												
13												
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Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H blow counts for the last two increments were converted to SPT N-Values using a factor of 0.6, to account for sampler type and hammer energy.

[2] Elevations based on NGVD 1929 and taken from "Pre-Demolition Survey for Morse Park", by Ifland Survey, dated 11/16/10.

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Project No.: 770602501 | Figure: A-6

TEST GEOTECH LOG 770602501.GPJ TR.GDT 8/25/11

PROJECT: **MORSE PARK**
Sunnyvale, California

Log of Boring B-7

Boring location: See Site Plan, Figure 2 | Logged by: W. Stegerstrom

Date started: 6/17/11 | Date finished: 6/17/11

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H)

LABORATORY TEST DATA

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						Ground Surface Elevation: 22.1 feet[2]						
0						2-inches Asphalt Concrete (AC)						
0.3						4-inches Aggregate Base (AB)						
1	BULK				CL	CLAY (CL) dark brown, very stiff, moist, trace fine sand R-Value, see Figure B-2						
3	S&H		7 13 16	17		LL = 49, PL = 20, PI = 29, see Figure B-3						
5	S&H		8 9 11	12	CL	CLAY with SAND (CL) light olive, stiff, moist, trace fine gravel						
6.5					SC	CLAYEY SAND (SC) yellow-olive, medium dense, moist, trace fine gravel						
8	S&H		5 6 7	8	CL	CLAY (CL) light olive with yellow mottling, medium stiff to stiff, moist						
9.5					SP	SAND (SP) olive to gray, moist, loose						
11	S&H		7 7 8	9	CL	CLAY (CL) light olive with yellow mottling, stiff, moist						
30												

Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H blow counts for the last two increments were converted to SPT N-Values using a factor of 0.6, to account for sampler type and hammer energy.
[2] Elevations based on NGVD 1929 and taken from "Pre-Demolition Survey for Morse Park", by Ifland Survey, dated 11/16/10.

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Project No.: 770602501 | Figure: A-7

TEST GEOTECH LOG 770602501.GPJ TR.GDT 8/25/11

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 4.76
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.075
coarse	No. 4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.420 to 0.075
Silt and Clay	Below No. 200	Below 0.075

Unstabilized groundwater level

Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered

Classification sample taken with Standard Penetration Test sampler

Undisturbed sample taken with thin-walled tube

Disturbed sample, hand auger

Sampling attempted with no recovery

Core sample

Analytical laboratory sample

Sample taken with Direct Push sampler

SAMPLER TYPE

C Core barrel

CA California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter

D&M Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube

O Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube

PT Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube

S&H Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter

SPT Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter

ST Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

MORSE PARK
Sunnyvale, California

CLASSIFICATION CHART

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Date 06/27/11 | Project No. 770602501 | Figure A-8

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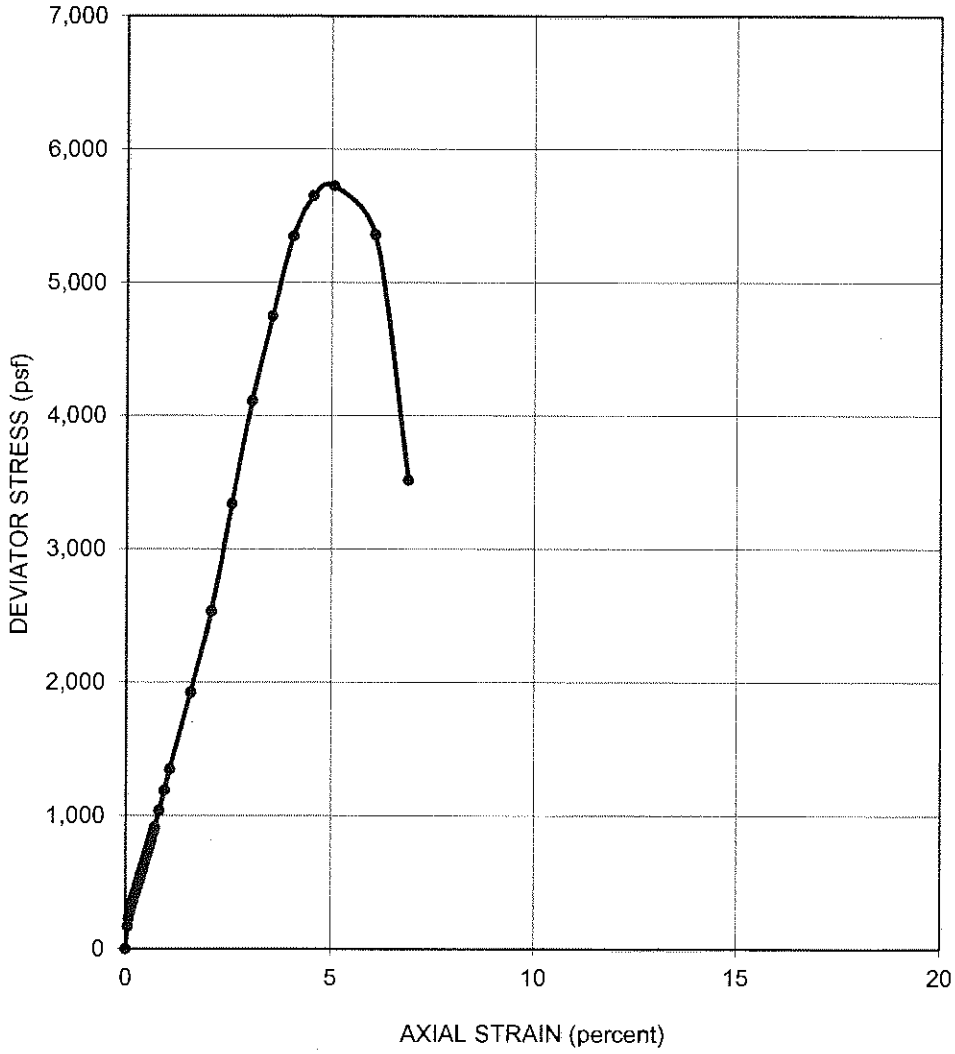
APPENDIX B

Laboratory Test Results



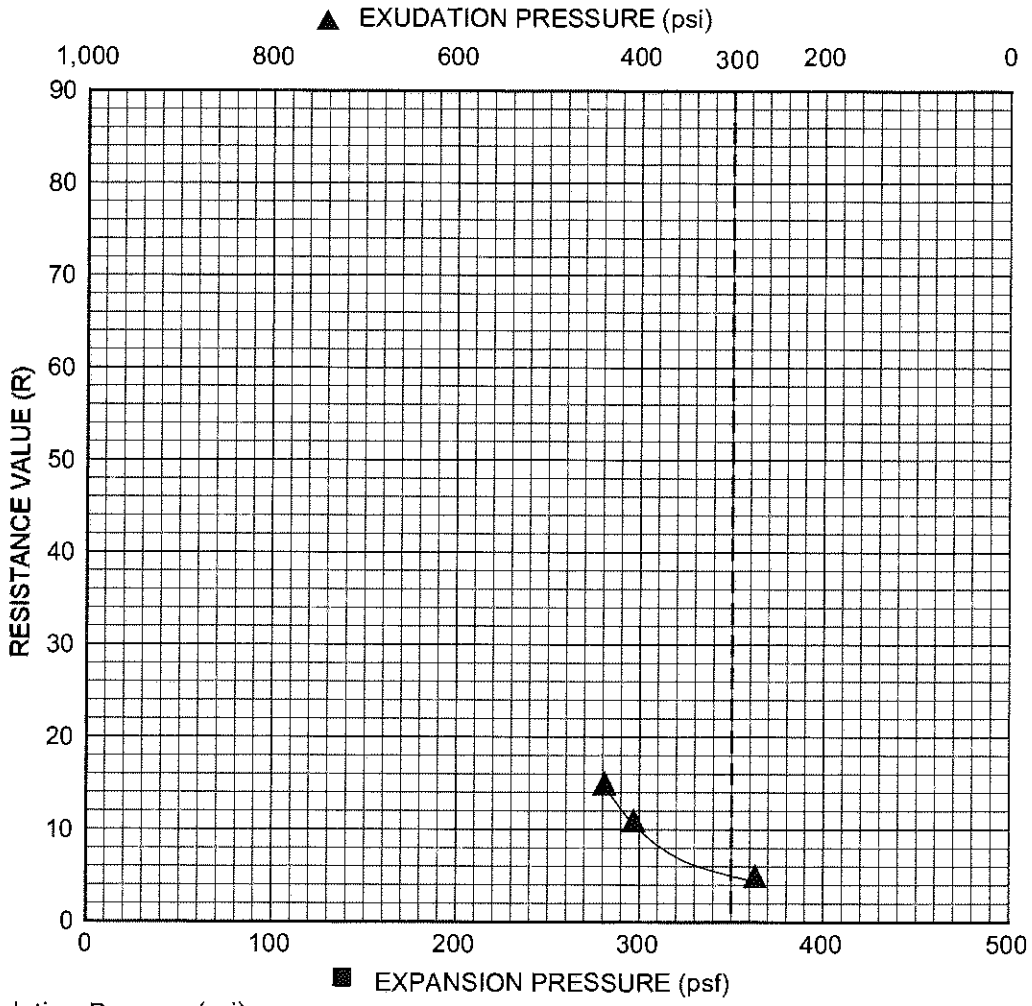
SAMPLER TYPE	Sprague & Henwood		SHEAR STRENGTH	2,860	psf
DIAMETER (in.)	2.4	HEIGHT (in.) 6.0	STRAIN AT FAILURE	5.1	%
MOISTURE CONTENT	17.9	%	CONFINING PRESSURE	300	psf
DRY DENSITY	103	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY (CL), olive-gray		SOURCE	B-2 at 3.5 feet	

MORSE PARK
Sunnyvale, California

UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Treadwell&Rollo
A LANGAN COMPANY

Date	08/25/11	Project No.	770602501	Figure	B-1



Exudation Pressure (psi)

Specimen ID:	A	B	C	D
Water Content (%)	20.9	22.7	26.2	
Dry Density (pcf)	105.3	101.0	96.5	
Exudation Pressure (psi)	438	406	274	
Expansion Pressure (psf)	0.39	136	148	
Resistance Value (R)	15	11	5	

Sample Source	Sample Description	Sand Equivalent	Expansion Pressure	R value
B-7 at 1-4 Feet	CLAY (CL), dark brown	--	--	5

MORSE PARK
Sunnyvale, California

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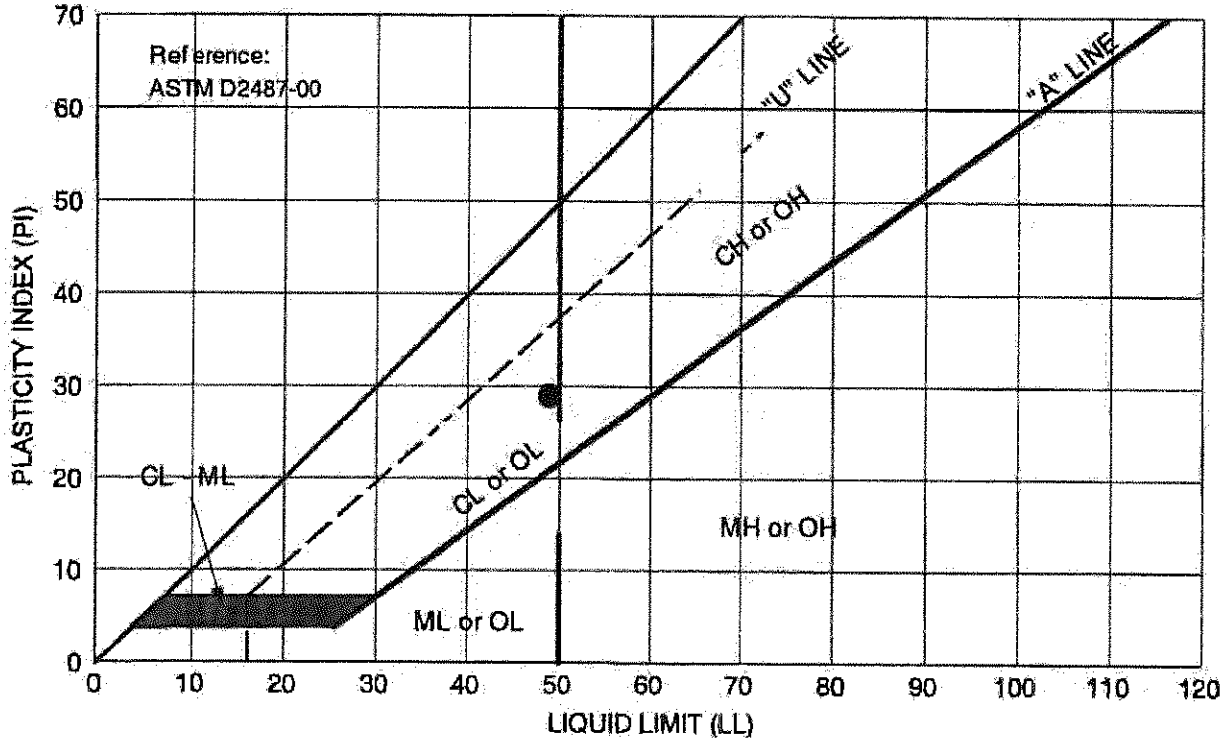
RESISTANCE VALUE TEST DATA

Date 08/25/11 | Project No. 770602501 | FigureB-2



Symbol	Source	Description and Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	B-7 at 3.5 feet	CLAY (CL), dark brown	–	49	29	–

MORSE PARK
Sunnyvale, California

PLASTICITY CHART

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Date 08/22/11 | Project No. 770602501 | Figure B-3

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APPENDIX C

Brief Corrosivity Evaluation

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

5 July, 2011

Job No. 1106180
Cust. No. 11308

Ms. Serena Jang
Treadwell & Rollo
501 14th Street, 3rd Floor
Oakland, CA 94612

Subject: Project No.: 770602501
Project Name: Morse Park, Sunnyvale
Corrosivity Analysis – ASTM Test Methods

Dear Ms. Jang:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on June 23, 2011. Based on the analytical results, a brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this sample is classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a detection limit of 15 mg/kg.

The sulfate ion concentration is 240 mg/kg and is determined to be sufficient to damage reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.50.

The pH of the soil is 7.9, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 420-mV, which is indicative of aerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call JDH Corrosion Consultants, Inc. at (925) 927-6630.

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax: 925 462 2775
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Client: Treadwell & Rollo/Lagan
Client's Project No.: 770602501
Client's Project Name: Morse Park, Sunnyvale
Date Sampled: 17-Jun-11
Date Received: 23-Jun-11
Matrix: Soil
Authorization: Chain of Custody

Date of Report: 5-Jul-2011

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1106180-001	B-6 #1 @ 3.5'	420	7.9	-	1,100	-	N.D.	240

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:	-	-	10	-	50	15	15
Date Analyzed:	28-Jun-2011	27-Jun-2011	-	23-Jun-2011	-	27-Jun-2011	27-Jun-2011

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

Treadwell&Rollo
A LANGAN COMPANY

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3 copies: Mr. Steven Sutherland
SSA Landscape Architects, Inc.
303 Potrero Street, Suite 40-C
Santa Cruz, California 95060

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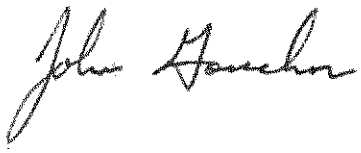

John Gouchon, GE
Senior Associate

Appendix B: Site Maps